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VIEWS, NEWS AND INTERVIEWS.

A well-known electrical man in Baltimore, who is noted for his quiet humor, went into a restaurant the other day and gave the waiter this shock :

"Have you read 'Trilby'?"

"Yessir," said the waiter.

"Well, then, bring me some of 'the altogether'."

After consultation with the proprietor and a complete failure to interpret the order, the joker was asked to explain what he wanted. All he said was "Hash."

Mica is reported to be a satisfactory substitute for selenite for use in polarizing outfits.

A well-known and brainy electrical man recently remarked: 'There is a great deal more intemperance in eating than in drinking. This is proved by the fact that many more people are afflicted with dyspepsia than have delirium tremens."

Electric heat has been applied with success to the thawing out of frozen water pipes in England. A wire is run into the pipe until it meets the obstruction and then the current is turned on.

The beneficent uses of the telephone are not as yet fully understood, says the San Francisco *Examiner*. The other night young Smythe awoke about 3 A. M. with an excruciating pain in his stomach. The more he squirmed the worse he grew. Finally the terrible thought flashed upon him that he had been poisoned. In a moment he dashed out of bed, down stairs to the telephone, and demanded to be switched on to his physician's number without delay.

"For Heaven's sake, doctor, come at once! I'm poisoned!"

The M. D., who had also crawled out of bed to answer the summons, growled back, "What makes you think so?"

"Frightful pain—awful cramps—insides on fire—hurry up, or I'm a dead man!"

"Humph! Does—er—does your stomach make any noise?"

"Yes; kinder growls—must be arsenic, or something."

"Growls, eh? Just put the 'phone against the pit of your stomach. Ah! I thought so—you've been to the French Hospital fête this evening, haven't you?"

"Yes, sir."

"Exactly. Your suffering from a general fermentation of lemonade, crab salad, fruit cake, pickled oysters and Roman punch. You're all right. Just take a little peppermint and ginger, then go to bed, and grin it through."

A New Trial of Mr. La Rue's Case.

Judge Wallace, sitting in New York city, in the United States Circuit Court of Appeals, has granted a motion for a new trial in the action of George W. La Rue against Arthur B. Cumner for $50,000 damages for alleged slander. In the first trial of the case, before Judge Wallace, the jury gave a verdict for the defendant.

An Electrically Equipped Carriage.

Mr. Frank W. Hawley, who is well known as the original promoter, in this country, at least, of electrically propelled canal boats and who is prominently connected with the Niagara Falls electric transmission project, has sent to the ELECTRICAL REVIEW a photograph of a stylish carriage and spanking pair of horses which he owns. The carriage is equipped with electric lights and an electric foot warmer, current for which is furnished by Chloride accumulators placed under the driver's seat.

FIG. 1.—BRISTOL'S RECORDING AMPERE METER.—(See page 145.)

Reading, Pa., has awarded to the Metropolitan Electric Light Company, which has no competitor, the contract to light the city for the next five years, instead of one, as heretofore. The city is to pay $105 per light per year for from 300 to 500 arc lights, and for from 500 to 700 incandescent lights $20.40 per light per year, all to burn all night and every night.

A Correction from Mr. Perry.

TO THE EDITOR OF ELECTRICAL REVIEW :

In looking over my paper on the "Storage of Energy," etc., read before the National Association at Cleveland, I find an error that does injustice to Mr. Halpin's method of steam storage. The figures were correct in my original manuscript but got changed in the haste in transcribing the printer's copy. In the printed copy the fixed investment charges are made to add up $994.39, whereas they add up only $788.39. This is so palpable an error that probably none but the casual reader would fail to detect it. It, however, places this method in a very wrong comparative light, and I will feel obliged if you will kindly call attention to the correction.

Making the change, the total fixed annual cost per electrical horse-power becomes $67.00 instead of $87.60, and the total annual cost $97.24 instead of $117.24, with coal at $1.75, and the total annual cost with coal at $3.50 per ton becomes $114.27 instead of $134.77.

Substituting these figures in the final comparative statement it will read thus :

RECAPITULATION.

	Coal $1.75	Coal $3.50	Savings affected. Coal $1.75	Savings affected. Coal $3.50
Present method, steady load	$49.68	$66.62	—	—
Present method, gas engine	68.98	103.61	29.50	44.79
Combined feed and steam storage	94.42	111.35	23.56	37.05
Without storage, load factor 25%	117.78	146.40	—	—
Fed storage	97.98	117.58	20.20	30.82
Steam storage	97.24	114.97	20.54	34.13
Complete battery storage	143.13	145.74	5.35	2.66

Yours truly,

NELSON W. PERRY.

New York, March 15, 1895.

THE PENNSYLVANIA RAILROAD AND ELECTRIC TRACTION.

As has already been announced in the columns of the ELECTRICAL REVIEW the Pennsylvania Railroad intends to equip its Mt. Holly branch, 12 miles in length, with electric cars on the overhead trolley system. It is now understood that this equipment will be in the nature of an experiment, which will have an important bearing on a longer branch of the same railroad. It is reported that the Pennsylvania Railroad has closed a contract with the General Electric Company for three sets of experimental apparatus of different sizes and styles to be used on the Mt. Holly branch. It is possible that one or more of the other electrical manufacturing companies may also be permitted to furnish experimental apparatus.

The experimental car equipment will consist of one set comprising four 25 horse-power motors; one set consisting of one 75 horse-power motor and one set consisting of two 75 horse-power motors, each set to be placed under 40-foot passenger coaches, rather lighter in construction than those generally used on steam roads, and which will eventually be developed into a standard electric passenger coach by the Pennsylvania Railroad.

The result of the experiments on the Mt. Holly branch will determine whether or not the Camden & Atlantic branch of the Pennsylvania Railroad will be similarly equipped. This branch is about 59 miles long, extending from Philadelphia to Atlantic City, and it is one of the oldest steam railroads in America.

The Pennsylvania has another branch extending to Atlantic City called the Atlantic & New Jersey road. The round trip fare from Philadelphia to Atlantic City over the last-named branch is $1.75, and this road will probably be maintained as a high-class steam road for express travel, the trip being made within an hour.

Granted that the Mt. Holly experiments are a success, it is proposed to similarly equip the Camden & Atlantic road with a center pole trolley construction. The purpose is to run trains on 10 minutes' headway on schedule time of two hours for the 59-mile trip. The fare for the round trip will be placed at $1.00 and it is believed that the road, when electrically equipped, will do a very large excursion business.

The Pennsylvania Railroad has already had some experience in the building and ownership of electric street railways and it may be depended upon that these experiments will be carried to the utmost limit and doubtless to complete success. The policy of the Pennsylvania Railroad in figuring on the electrical equipment of the Camden & Atlantic branch is extremely far-sighted and will undoubtedly have an important influence on the equipment of other short steam railway lines.

The Rating of Feed-Water Heaters.

The methods of rating feed-water heaters have been a vexed question among mechanical engineers and the term "horse-power," as applied to heaters, has been an indefinite one. The difference in engines of high and low grades makes it necessary to explain the term "horse-power" in each particular case when referring to feed-water heaters.

In an endeavor to arrive at some tangible standard of rating, the Feed-Water Heater Manufacturers' Association was formed. At a convention recently held in New York city, the association passed the following resolutions, which have been sent to the ELECTRICAL REVIEW by Secretary Frank A. Thayer:

We, certain manufacturers of closed feed-water heaters, in convention assembled declaring that a better understanding among ourselves and also between each of us and our customers in the matter of rating of feed water heaters, is much to be desired, do hereby

Resolve, That we believe that the only proper rating for feed water heaters is one which is based upon the square feet of heating surface contained in the heater. For the purpose of giving practical shape to this belief we do further

Resolve, That we hereby agree that for the future we will in each and every case in which we are called upon to make prices upon heaters, state the exact number of square feet of surface which we are offering; to give further effect to this action we

Resolve, That we will in each and every case, state without reservation, both in our printed catalogues and in our specifications, the diameter of the tubes, the number of lineal feet thereof and the total square feet of heating surface in each heater offered.

Resolved further, That the secretary be requested to transmit a copy of these resolutions to every manufacturer of closed heaters in the United States.

And we hereby agree to live up to the spirit and the letter of the foregoing and to bind ourselves so to do by our signatures affixed below.

Resolved finally, That the secretary be requested to invite all closed heater manufacturers of the United States to join this association and to subscribe to the foregoing resolutions.

Signed,

THE TAUNTON LOCOMOTIVE MANUFACTURING CO.,
(Makers of the Wainwright feed-water heater.)
BENJ. F. KELLEY & SON,
(Makers of the Berryman feed-water heater.)
WM. BARAGWANATH & SON,
(Makers of the Baragwanath feed-water heater.)
THE GOUBERT MANUFACTURING CO.,
(Makers of the Goubert feed-water heater.)
THE NATIONAL PIPE BENDING CO.,
(Makers of the National feed-water heater.)
ROBT. WETHERILL & CO.,
(Makers of the Wetherill feed-water heater.)
KEYSTONE ENGINE AND MACHINE WORKS,
(Makers of the Kensington feed-water heater.)

A Contemporary's "Enterprise."

The attempt at enterprise on the part of our contemporary, *The Electrical Engineer*—it has occasional spasms of this nature—in publishing abstracts of the text of the Bate decision reminds one of the friend of the sick man who, in his desire to do something to cure the invalid, ground up a barrel of horse-radish. It was a case of misplaced energy. The sick man could not eat the horse-radish and no one cared for the text of a decision that could have no bearing on anything else. It was the yea and nay only that interested.

THAT OBNOXIOUS PATENT STATUTE.

OBSERVATIONS ON PROF. ELIHU THOMSON'S LETTER.

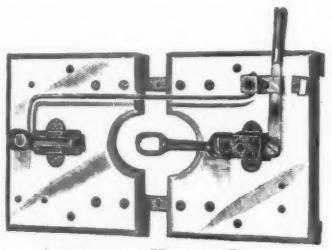
TO THE EDITOR OF ELECTRICAL REVIEW:

How long is the United States inventor to be handicapped, or practically put under a ban, by the unjust conditions imposed upon him by that section of the patent law, the meaning of which was construed by the Supreme Court in the Bate case?

This is the question asked by Prof. Elihu Thomson in a statement written in his clear and forcible style and printed in the ELECTRICAL REVIEW of March 13.

No man can answer it, but it is well to keep the interrogation standing in plain sight before the American people. This unjust law has been in force for 25 years. It declares that *every United States patent granted for an invention, which has been previously patented in a foreign country, shall expire at the same time with the foreign patent having the shortest term*, and no competent authority has ever doubted that it means just what it says.

No more magnificent arguments were ever made in any cause than those presented to the Supreme Court in support of the opposite view, but they were the arguments of able and skillful lawyers paid to advocate the interests of their clients. This appeal to the court was not to interpret, but to change the law. The argument, most plausibly and eloquently presented, was that while Congress did one thing it *intended* to do something else. There was an apparent vein of keen sarcasm in the voice of Justice



ADJUSTABLE HANGER BOARD.

Harlan as he read that portion of the decision which referred to this point, clearly indicating that the court is not endeavoring to solve the riddle which is puzzling the world and find out what *Congress intends to do.*

The injustice of the obnoxious statute has been recognized since the day of its enactment, and constant endeavors have been made to have it amended. Inventors, patent attorneys, the commissioners of patents, have uniformly favored the change; scarcely anybody has opposed it.

A definite reason for this anomaly is not easy to find, but some of the obstacles are plainly evident.

Inventors and their representatives are much inclined to be exclusive, secretive and suspicious, and fail to realize that, in many respects, their interests are identical and would be promoted by cordial co-operation. Their legal representatives, whose business it is to shape legislation, are too often actuated by a determination to advance the immediate interests of their clients without regard to the effect of such action upon the general welfare of patentees, or upon their own future. Last year a bill amending the law in question received very favorable consideration in the House Committee and was about to be reported, when one of the largest manufacturing corporations in the country saw the opportunity of reviving some of its old patents by making the law retroactive, and the strenuous efforts of its lawyer roused active hostility and killed the bill. This practice of attempting to attach some selfish individual scheme to a measure of national importance has always embarrassed and thwarted the efforts to correct this evil.

There are in every Congress Senators and Representatives always on the watch for a chance to injure or destroy the patent system, and this is a standing obstacle to any useful legislation on this subject. Amendments abolishing the Patent Office have been proposed to pretty much everything, except the Chaplain's prayers.

Another reason why necessary legislation is so difficult is that the Patent Office is to a considerable extent non-political, and does not provide places for Congressmen's constituents in search of an easy job.

The failure to secure proper legislation has called forth a vast deal of abuse of the nation's legislators, which is neither reasonable nor just. Water never rises higher than its source. The real responsibility rests upon the people who put Congressmen into office, and the inventor who demands just laws should recognize his responsibility in choosing the men who make the laws. There have been legislators chosen from Professor Thomson's nearby neighbors, who did not set shining examples of broad-minded statesmanship.

When more practical, fair-minded business men and fewer partisan tricksters are sent to Congress; when the leading representatives of patent interests will harmoniously join in one strong effort, the "ban" will be lifted. Will some far-sighted man of genius gaze into the future and tell us when he discovers this forerunner of the millennium?

GEO. C. MAYNARD.

Washington, D. C., March 15, 1895.

Adjustable Hanger Board.

The Hammond Cleat & Insulator Company, 15 Custom House street, Boston, Mass., are the manufacturers of the adjustable arc light hanger board illustrated herewith. The makers claim that this is the only board which conforms to the rules of the Insurance Exchange. It is made of porcelain and metal and is moisture and fireproof. All the electrical parts are in plain sight. The board, which is perfectly adjustable, can be used on either high or low potential circuits, being provided with a jack knife switch for the latter use. It is furnished in two sizes. The distance between contact terminals is adjustable from five inches to eight inches and from nine inches to 12 inches.

TESLA'S LABORATORY BURNED.

THE DISTINGUISHED INVENTOR'S HEAVY LOSS BY FIRE OF APPARATUS AND RECORDS.

By a fire which almost completely destroyed the six-story and basement building at 33 and 35 South Fifth avenue, New York city, March 13, Nikola Tesla, the electrician, lost all of the apparatus with which he has been carrying on his professional experiments. Mr. Tesla occupied the entire fourth floor. When the floor gave way his apparatus fell to the second floor, where it remained in an unrecognizable ruin. It was not insured.

Mr. Tesla was naturally considerably affected by this sudden and most disastrous loss, but with true grit at once began preparations to resume his work elsewhere. In an interview he says :

I am congratulating myself all the time it is no worse. I begin all over again, but I have the knowledge and experience of what has gone before, and fortunately I was able to show with completed apparatus that my ideas and theories are correct. Had the fire occurred a few months ago, I should have been robbed of the opportunity of many highly successful demonstrations. Take my oscillator, for example, that combines the steam engine and dynamo. Last Fall, for example, I had there a gathering of medical and other professional men—perhaps 200—and they all saw the machine running, lighting up my laboratory with plenty of lights and furnishing current for a series of novel experiments. The machine is gone. But suppose the fire had happened before that or before others had seen it running? My statements about it would not have been half so convincing. Everything is destroyed—practically all—although, of course, where some of it has passed into commercial operation the interest in that part was of an historic and personal nature. I had a cabinet containing many of the earlier inventions, over which I have brooded and worked days and nights. To-day the ideas there embodied are utilized in the big 5,000 horse-power generators at Niagara and in kindred motors in a great many parts of the world ; but I prized the old models and trial apparatus, and would not have taken any money for them. Some of them were shown in the Electricity building at the World's Fair, where also some of the new principles I have discovered were illustrated by operative devices. These devices I had in my laboratory, and they have gone down in the wreck, too. Moreover, I had there some records, books and papers, such as every industrious experimenter is likely to get around him in time, and they have vanished. Happily, a good deal of my work has appeared in book form now, or in the technical journals, and that much is secure. The rest, he added, with just a little note of sadness in his voice, I shall try to jot down as soon as I can get time from more pressing matters. You know an inventor while making experiments often gets a few spare minutes between whiles, and I had been employing some of these spells lately in getting my data in better order. Part of that work has gone also.

I was engaged on four main lines of work and investigation. One of these was the oscillator, which I cannot but regard as a practically perfected machine, but which, of course, suggests many new lines of thought every day. Another was improved methods of electric lighting. Another was the transmission of intelligence any distance without wires. A fourth, which is an ever present problem for every thinking electrician, touches the nature of electricity. Each of these questions and many others I shall follow up, and somehow I cannot help feeling that this disaster will sharpen my intuition as to the best lines of work, so that good will come out of evil. With so much on my mind and hands I need not excuse myself for being brief with you. I have been overwhelmed with generosity and sympathy this week, and feel the kindness deeply, even if I can make no response. But I must carve my way through or over the mountain suddenly planted in front of me, and so you see me preoccupied. I am glad to add to-day that by last reports from the scene of the fire some of the debris is in better shape than I dared hope, and I may yet see some valuable salvage. But my men are meantime busy as though none of the old were left.

A Swiss Electric Railway Project.

Swiss electrical engineers seem to be bent on showing to the world what feats can be accomplished with electric motors. Witness the latest project of an Alpean electrical railway proposed by La Compagnie de l'Industrie Electrique of Geneva. It is planned to connect Zermatt, Gornergrat and Mount Cervin. Starting from the Zermatt depot, the Gornergrat road is to be constructed along the Winkelmatt on the right bank of the River Viège; thence ascending through the forests to the Hotel Findelen, on the Riffel Alp, it will turn towards Mount Riffel, and gain the Gornergrat at an altitude of 10,264 feet above the sea level.

The necessary motive power is to be derived from four rivulets, *i. e.*, the Findelenbach, Toeschbach, Zmuttbach and Fürggbach. It is estimated that 600 horse-power is needed to move simultaneously three trains of 18 tons each, and that three turbines, each capable of developing 200 horse-power, with 600 litres per second, descending 100 metres, can well do the work. An electric motor will draw one car having a seating capacity for 60 excursionists. The entire length of the road, which actually would be the highest electrical railroad of the world, is to be 10 kilometres, costing 350,000 francs. The estimates are based upon the number of travelers which annually visit Zermatt and the surrounding localities, and it is stated that the probable annual receipts (270,000 francs) would enable the company to pay from three to five per cent dividends on the capital stock.

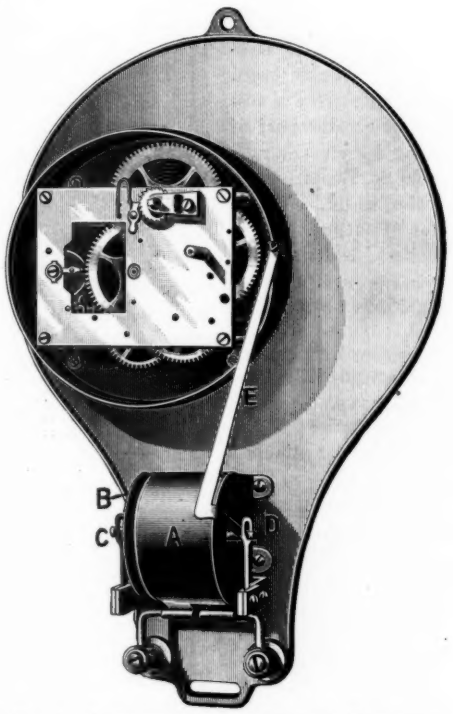


FIG. 2.—INTERIOR VIEW OF BRISTOL'S RECORDING AMPERE METER.

An Edison Lamp Injunction Dissolved.

Judge Lacombe, on March 15, dissolved an injunction which was obtained by the Edison Electric Light Company on July 21, 1893, prohibiting the United States Electric Lighting Company, of New York city, from using certain incandescent lamps alleged to infringe the Edison patent. Justice Lacombe based his judgment on the Supreme Court decision in the Bate case and dissolved the injunction.

The Gas and Electricity Committee of the Brooklyn, N. Y., Board of Aldermen has reported adversely on the application of the State Electric Light and Power Company and the Mutual Gas and Electric Company for franchises.

Bristol's Recording Ampere Meter.

The accompanying engravings illustrate a new recording ampere meter which is being placed upon the market by the Bristol company of Waterbury, Conn. This instrument, in connection with the company's recording volt and watt meters, which are already well known, makes it possible to keep a continuous record, day and night, of the output of an electric lighting or power plant.

The general design of this instrument is clearly shown in Fig. 2, an interior view, from which it will be seen to consist of a stationary solenoid, an armature B carried by a non-magnetic shaft through the center of the solenoid, the shaft being supported at its opposite ends on steel knife edge spring supports C and D, the same as in Bristol's recording volt meter.

The recording pen arm E is secured directly to the steel spring support D and partakes of its angular motion as the armature is attracted to the coil or solenoid by a current passing through the solenoid. Although the actual distance that the armature itself moves is small, it will be observed that it transmits an angular motion to the pen arm, resulting in a wide range on the chart without employment of multiplying devices between the spring and the pen.

A novel feature of this instrument is the form of armature which is used to procure a chart with the divisions nearly uniform throughout its range. It consists of two parts, a flat and very thin disk of iron and a small sleeve or core of iron on a non-magnetic shaft. The sleeve is completely concealed from view within the solenoid. The disk is stiffened by a plate of non-magnetic metal.

If the armature consisted simply of the flat disk portion, the magnetic attractive force would increase very rapidly as it approached the solenoid, giving a chart with divisions as in the Bristol's recording volt meter, contracted at lower portion on the scale but very open at upper portion, while if the armature consisted only of the core portion, the attractive force upon it would decrease as it approached the central or neutral position of the solenoid, and the divisions for the lower portion would be quite open becoming contracted at upper portion of the scale.

After considerable experimenting a combination disk and core armature has been found which produces the nearly uniformly divided scale, as shown in the specimen section of a chart, Fig. 3, for a range of 15 amperes.

The armature and moving parts are reduced to a minimum in size and weight to avoid magnetic lag and the effect of the inertia when current is thrown off and on. To provide for cases where there are extremely rapid and large fluctuations in the current to be recorded, as for example, on an electric railroad, a damping device will be provided which consists of a vane of aluminum secured to the left knife edge spring and immersed in a vessel of glycerine.

For low ranges the solenoids are designed to carry the entire current, but for high ranges shunts will be provided.

FIG. 3.—SECTION OF SCALE OF BRISTOL'S RECORDING AMPERE METER.

THE ELECTRICAL INDUSTRIES OF ST. LOUIS.

BY WILLIAM B. BRYAN, IN THE ANNUAL REPORT OF THE ST. LOUIS MERCHANTS' EXCHANGE.

St. Louis has always held an important position in the varied applications of electricity, and in the manufacture of apparatus, material and supplies for electrical work. For many years it has ranked as one of the leading cities of the world in electric lighting and railway work. A few years ago it was known positively that St. Louis outranked the world in these directions, and it is by no means certain that she has been outstripped even yet, although many of the large cities seem to have recently awakened to the advantages of electricity, and are now making rapid advancement. In St. Louis, however, the original and most extensive work was done, paving the pathway for the future, and demonstrating the practicability and soundness of electrical investments upon a large scale.

The arc lighting of St. Louis is done by four companies, who operate about 4,500 lights of a nominal capacity of 2,000 candles each. The incandescent lighting is done by three companies, which now have approximately 175,000 lights connected. The electrical equipment of these several stations aggregates 20,000 horse-power. The service extends over the entire city and as far west as Kirkwood. In common with other interests they have suffered somewhat from the business depression of 1894, and their growth, while it has by no means ceased, has not been as large proportionately as in former years. The year 1895 will see extensive enlargements made, both to the plants and distribution systems. The most important advancement to be expected in the immediate future is the placing of the major part of the wiring under ground, which consummation it is expected will be reached within the next twelvemonth.

St. Louis also ranks high in the distribution of electricity for power purposes. Three companies distribute an aggregate of about 4,000 horse-power throughout the city. Electricity has displaced steam in hundreds of small manufacturing establishments, and has recently come into quite extensive use for elevator service in our tall buildings, for which it seems to be admirably adapted.

It is in connection with street railways, however, that electricity has met its widest field of work in this city. Nine companies, capitalized at about $17,000,000, operate some 275 miles of single track, running 500 motor cars, with 20,000 horse-power of electrical equipment, and 600 trailers. There are eight power houses, with a total electrical equipment of about 23,000 horse-power. These lines carried 65,000,000 in 1894, a gain of about eight per cent over 1893. These roads have added to their equipment during the year 1894 steam and electrical apparatus of 8,500 horse-power, valued at $800,000, and have built during the year 33 miles of single track. The electric railway companies employ about 4,000 men regularly. Considerable extensions will be made during the coming year, and a number of suburban electric roads, connecting with existing downtown lines, will probably be built.

In electrical manufactures St. Louis ranks high. It has always been a center of the carbon industry and continues so at this day. The manufacture of incandescent lamps has also grown to be large and important. Recently the manufacture of alternating current motors, fans and converters has been taken up and is being actively pushed. The product of these factories has become widely known and goes to all parts of the globe.

Five large supply houses furnish electrical material and equipment. The capital invested is in the neighborhood of $125,000, and they did a gross business of about $500,000 during 1894, being just about the same as was done in 1893. These companies carry a stock valued at about $125,000 and the territory covered includes the entire Southwest.

A large number of contractors for electrical construction operate in and near St. Louis. It has been impossible to ascertain the volume of their business for 1894, but it is known to be large.

In interests closely allied to electricity St. Louis also ranks high. Four large street car factories are now in full operation, the greater part of their product being for electric railways. In this field St. Louis has for some years, led the world, both in quantity and value of output.

In engines, boilers, shafting and belts, entering into the equipment of electrical stations, a large business has been done.

No Swivel Joints on the Electric-Lighted Buoys.

TO THE EDITOR OF ELECTRICAL REVIEW:

How are the electric cables attached to the electric-lighted buoys in Gedney Channel, New York Harbor? Is there a swivel? How is the rise and fall of the tide and the play of the waters allowed for?

Please answer these questions to decide a wager. RAILROAD.

New York, March 15, 1895.

[Each electric-lighted buoy has an electric cable of its own running from the dynamo station on shore to the base of the spar forming the buoy. The cable is carried to the light in the cage at the top in a slot sunk in the side of the spar and covered with a wooden strip. In the lower end of the spar is an iron eye which runs through another eye in a mushroom anchor, which keeps the buoy in its proper location in the channel. Enough slack in the electric cable is allowed to prevent it being strained. This method of anchoring prevents any turning of the buoy about a vertical axis, but allows it full play to rise and fall with the water. So no swivel joint is used, because none is needed.]

The Optical Efficiency of Common Sources of Light.

Considering that the chief application of electricity at the present time is to lighting purposes, it is rather strange that there should be among electrical engineers so little accurate knowledge of the first principles of optics, says *Electrical Plant*. Perhaps to this cause is attributable the fact that, while many engineers are occupied in improving, some one or two per cent, boilers, engines, dynamos and other plant for the conversion of forms of energy, up to the present time comparatively few have turned their attention to what apparently promises a far more hopeful field of research. Perhaps it is not inadvisable at times to remind ourselves how little real advance has been made in lighting matters since our fathers first adopted the rushlight for illuminating purposes. We have frequently had occasion to point out in these columns that, in view of the high efficiency to which boilers, engines and dynamos have now been brought, further economies in these directions do not present a very hopeful field for research, as there is no room for any very substantial improvement. On the other hand, the optical efficiency of nearly all known sources of light is extremely low. By the term optical efficiency must be understood the ratio of energy expended in producing the sensation of light to the total energy dissipated in the lamp. The sensation of light is produced by such vibrations of the ether as are capable of affecting the retina; namely, vibrations having a wave length between 0.00081 and 0.00036 of a millimeter. The optical efficiency—energy expended in producing light—of the various common sources of light is, according to the latest determinations, as follows:

Oil lamp	0.073	per cent.
Ordinary gas flame	0.33	"
Incandescence lamp (electric)	1	"
Arc lamp	3.875	"
Magnesium light	15	"
Sun	31	" (about)
Geissler tube	32.7	"

The firefly or glowworm can hardly be described as common sources of light. Their optical efficiency, however, is so high that they are worth notice. The optical efficiency of the firefly is practically 100 per cent; the whole of the energy expended by the insect in producing radiation being in the production of vibrations having a wave of such length as to produce the sensation of light. In view of the high efficiency, therefore, of this insect as a generator of light, a company which had for its aim the capture, sale and maintenance of fireflies for domestic purposes should be a profitable undertaking, if the first cost of the "generating" plant did not prove prohibitive.

It is worth noting that the greater part of the energy dissipated, in connection with the various artificial sources of light, in producing non-luminous rays, is expended in the production of vibrations having a wave length of about twice that of a vibration which produces the sensation of light. A very superficial examination of the many forms of lamps shows, however, that there is little hope for substantial improvement in the particular lamps in question. The light-giving powers of the arc lamp depend upon the degree of incandescence to which the carbons are raised. As, however, the crater of the arc lamp is close on the point of volatilization of carbon, no substantial improvement can be looked for in this source of light. The magnesium light, also, could not be made more efficient except under pressure, and the incandescence lamp is limited in its light-giving capacity for the same reason. The Geissler tube is so far ahead of all these other lamps as an illuminating source that the attention which has been turned to it by Mr. Tesla and others, with a view to producing a really practical lamp in this form, would appear to be well merited.

Influence of Telephone Wires on Atmospheric Electricity.

The German Department of Telegraphs has been carrying on an investigation with a view to determining what effect the telephone wires in cities have on atmospheric electricity; *i. e.*, whether the danger from lightning is increased or decreased by the presence of the miles of wires now necessary in cities in which the telephone is extensively used. According to *Das Wetter* (November, 1894, page 264), the result of the investigation has been to show that the wires tend to weaken the severity of thunderstorms and to decrease the danger from lightning. From information received from 340 cities with telephone wires, and from 560 without them, it appears that the danger of damage by lightning in the two classes is as 1 to 4.6. Although, as is the common experience, the danger from lightning is greater in the country than in cities, and it is therefore to be expected that the towns without telephones, which are generally country villages, should show a greater percentage of damage by lightning than large cities, yet the difference cannot be more than 50 per cent; while in the figures just given it is seen that places without telephones are almost five times more liable to damage by lightning than the places with telephones. A further interesting point is this: That in the former class, *i. e.*, places without telephones, five lightning strokes on the average occur during every hour of thunderstorm activity, while in cities with telephones only three occur. It appears, therefore, that the presence of many wires in our cities is a protection against damage by lightning, and does not increase the damage, as has been often supposed.—*American Meteorological Journal.*

The City Council of Ashland, Wis., ordered all the city electric lights turned off on March 1. The electric light company does not admit the council's authority to order out the lights, but as the city hasn't paid the company a dollar in two years the lights were shut down.

PROF. GEORGE FORBES ON NIAGARA AND ITS CRITICS.

IN HIS LONDON ROOMS THE ENGLISH ENGINEER SAYS SOME SHARP THINGS ABOUT AMERICANS.

Under this heading there appeared an illustrated interview of some length in London *Lightning* for February 28. The following is a brief abstract of the interview:

"The work at Niagara," said the reporter, "has been, from the beginning, subject to a good deal of hostile criticism, and the idea occurred to me that through this interview you might care to give an authoritative answer to such criticism."

"Well," said Professor Forbes, "I think the time has come when I may speak freely; the best answer to the criticism of the scheme is that all I said in my Institution paper has been justified by the event. * * * The chorus of disapprobation has afforded me the keenest pleasure, since I knew I was right. When I read my paper I did not claim to have originated anything of startling novelty in the system or the designs, but now, after this almost universal disapproval, I can at least claim that I discovered 'low frequency.'"

"Was not the low frequency objected to on the ground that the transformers would have to be very large, expensive and of low efficiency?"

"Yes, and the objection was natural from engineers whose work has been merely on a small scale, comparatively. They left out of account the need for large cooling surface. As regards cost, the largest size used in England cost, as may be seen from the makers' lists, £2 10*s.* per horse-power, but owing to the cost of manufacture being much reduced with large sizes, I made an estimate two years ago for large transformers of high efficiency, even with very low frequency, at 15*s.* per horse-power, and the actual cost came out under 12*s.* per horse-power, and that with a guaranteed efficiency of over 98 per cent. Any of our leading electrical engineers might have, and probably would have, arrived at the same result had they been called on to design apparatus on this large scale, and for power rather than for light."

"May I, without offense, ask whether the machinery actually in use is altogether from your designs? I ask the question because I remember a letter from the Westinghouse company claiming that the designs and details of the whole system originated with their own engineers."

"That letter was absolutely without foundation. Only three dynamos and switchboards were ordered from the Westinghouse company. The plans of the dynamos are from my original designs, modified to meet the requirements of local workshops. The switchboards, however, are altogether designed by the Westinghouse company. The transformers to continuous current and the cables are by the General Electric Company. American manufacturers refused on any terms to undertake the turning out of dynamos at higher voltage than 2,000 volts, or 2,500, according to the excitation. Consequently we abandoned the oil circulation through the coils and returned to the ordinary winding-in notches instead of placing fewer coils further apart. Manufacturers were asked to tender for the carrying out of the designs, with any modifications, and the tender of the Westinghouse company was accepted."

"Other designs for the dynamo were submitted to the Cataract Construction Company?"

"Yes; but none of them met the requirements. A powerful fly-wheel effect was required to govern the turbines, and at the same time the weight needed to be limited to what the hydraulic piston would support. No manufacturer could meet both these requirements; the Westinghouse company failed with the others; every design sent in was useless without a heavy fly-wheel. the addition of which would exceed the limit just mentioned. Indeed, all the designs sent in were remarkably alike, and only an entirely new departure could meet the requirements of the turbine manufacturers, and save the Cataract Construction Company from an awkward dilemma."

The reporter asked Professor Forbes when the dynamo he designed would be running at Niagara Falls.

"I really can't say; there is no reason for any further delay; everything is ready; but manufacturers in America are slower in work, and less certain in fulfilling promises, than here. They are, moreover, unaccustomed to the consulting engineer, and rather object to the practice of employing

PROF. GEORGE FORBES.

one, though I have been fortunate in finding that most of them are now ready to carry out my designs."

"Except as regards high voltage."

"Except as regards high voltage—yes, but that will come."

"What can you tell me with regard to Professor Rowland and his suit against the Construction company?" I asked.

"Ah! I could say a good deal about that, but I would rather not discuss it."

"He won his action, at any rate; but I suppose that meant that the company had to pay for services they had ordered, though they did not act on the advice given them."

"Precisely; and that recalls a very interesting point in the early history of the undertaking. Professor Rowland is, as you know, the first electrical scientific authority in America, as Lord Kelvin is in England. Well, in 1890, the Cataract Construction Company obtained from both these eminent men opinions in favor of the use of the continuous current; they went so far as to say that the alternating current was quite unfitted for the purpose, and I was informed that Lord Kelvin, in considering the scheme I submitted, even tried to pass a resolution to the effect that alternating currents could never be used. I only wish he had succeeded," continued the professor, with rising enthusiasm; "it would have been the happiest moment in my professional life, for I knew that they must come to them in the end."

"You had then, at that date, expressed views in favor of alternating currents?"

"Yes; in 1890 I reported" (turning to a drawer to find the report). "Yes, here it is, dated December 31, 1890:—

"'In the existing state of electrical practice in regard to motive power, it will be somewhat startling to many, as I confess it was at first to myself, to find, as the result of a thorough and impartial examination of the problem, that the only practical solution for Buffalo, and the best solution for the new industrial city which it is proposed to build near Niagara, lies in the adoption of alternating current generators and motors. I have not the slightest doubt, however, as to the accuracy of my conclusions, which must inevitably be accepted after full consideration.'

"In the following year I had no intercourse with the Cataract Construction Company, but they made independent inquiries, and came to the conclusion that I was right."

"Why, then, did they apply again to Professor Rowland?"

"They wanted to make him say that alternating current was the right thing, and they succeeded. At that time he had paid little attention to alternate current work, and, in fact, they had to pay him for the sacrifice of time in getting up the subject. Lord Kelvin, however, from the first down to his last letter of November, 1894, has been constantly urging the disastrous consequences of adopting the alternating system.

"Time, however, is on my side, and fresh proofs are turning up every day with regard, not only to alternating current, but also to low frequency. The General Electric Company of America are, I see, advertising that since they adopted low frequency for their transmission of power plant they have had no difficulties caused by self-induction or capacity, and that current may be transmitted over any distance in consequence of its low frequency."

"I expected," concluded Professor Forbes, "to have endless trouble in getting my views carried out, knowing the tendency in America towards rough and hasty engineering; but I was agreeably surprised to find how ready they were to listen to argument."

A Lecture by Professor Pupin.

Prof. M. I. Pupin, of Columbia College, will deliver a lecture on "Tendencies of Recent Electrical Research" before the New York Academy of Sciences in Hamilton Hall, Columbia College, Madison avenue and Forty-ninth street, New York city, on Monday evening, March 25 at eight o'clock. All persons interested in the science of electricity are cordially invited to attend this lecture.

Franklin Electrical Society.

Experimental lectures by W. W. Ker on "The Telephone: How It Works," and by N. Harrison, electrical engineer, on "Electrical Measurements and Tests" will be delivered before the Franklin Electrical Society, at its rooms, 239 and 241 East Fifty-seventh street, New York city, on Saturday evening, March 23, at eight o'clock. All interested are cordially invited.

Lucky Thirteen.

[*From the Mining and Scientific Press, San Francisco.*]

The ELECTRICAL REVIEW, published at "13 Park Row, New York, was 13 years old last week, February 13." Here's a trio of thirteens that's sure to continue good luck for the ELECTRICAL REVIEW. Long life, continued success and prosperity to you. May your light continue to shine up to full standard.

LETTERS FROM OUR FRIENDS.

A FEW EXTRACTS FROM THE "ELECTRICAL REVIEW'S" MAIL.

"SPEAKS VOLUMES FOR THE CIRCULATION."

TO THE EDITOR OF ELECTRICAL REVIEW:

The little card that we inserted in your paper, asking for soliciting agents for our telephone, has brought us in inquiries not only for agencies from a large number of good men, but also several direct orders.

The results were very much in excess of our expectations for so small an advertisement, and speak volumes for the circulation of your valuable paper, and the care with which it is read by your subscribers.

As soon as we get up cuts of our new designs of telephones and switchboards we shall certainly want more space. Truly yours,

M. & B. TELEPHONE COMPANY.

Philadelphia, Bullitt Building, March 14, 1895.

FROM INDIANA.

TO THE EDITOR OF ELECTRICAL REVIEW:

Enclosed is three dollars for the ELECTRICAL REVIEW, which I could hardly do without now. It keeps me posted and up to date.

W. E. Ross.

March 11, 1895.

THE FIRST "OPPOSITION" EXCHANGE.

TO THE EDITOR OF ELECTRICAL REVIEW:

Enclosed please find check for $3.00 for one year's subscription for the first *opposition* telephone exchange put in operation in New England, having commenced operations February 7, 1894, only one week after patent went off. We now have 122 names on our list, which is three times as many as the Bell company has. C. K. HUNT.

West Winsted, Conn., Mar. 12, 1895.

TO THE EDITOR OF ELECTRICAL REVIEW:

I like the ELECTRICAL REVIEW and shall keep it as long as I am able. Enclosed please find draft for subscription. H. H. M.

Argyle, Wis., March 12, 1895.

FOUND THEIR CARDS IN THE "REVIEW."

TO THE EDITOR OF ELECTRICAL REVIEW:

I have received your valuable ELECTRICAL REVIEW and it was of great service to me. I communicated with a number of your advertising firms for prices on goods that I wished to use. The ELECTRICAL REVIEW, I must say, is of great value to anyone who is looking for electrical information. S. K. M.

Brooklyn, N. Y., March 14, 1895.

"CAN'T GET ALONG WITHOUT IT."

TO THE EDITOR OF ELECTRICAL REVIEW:

I like your paper and don't see how I can get along without it.

AMBROSE ALLEN.

Medicine Lodge, Kas.

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At last it would seem that the business revival has come to stay.

During 1894 there were 1,600 patents issued in the United States for electrical inventions.

The Supplement to this issue of the ELECTRICAL REVIEW contains matter of special interest to the telephone companies of the United States.

A FEW WORDS ON THE LAMP SITUATION.

Now that the long pending and much wished for decision in the celebrated Bate case has been rendered, and the patent question definitely settled for the time being, its effect on electrical interests, particularly the manufacture of incandescent lamps, is the important topic of the hour.

The field being open, and the restrictions which have so long hampered the general spread of the industry removed, there is a feeling of uncertainty, not only throughout the trade at large, but among the manufacturers themselves, as to what the next step will be, particularly in the matter of prices.

To those contemplating entering the business, as well as to those already established, this question is one of vital importance and is worthy of the most careful consideration. There has long been a feeling that as soon as the bars were taken down there would be a tremendous rush of new concerns into the field, and that in the ensuing struggle for business prices would be driven down to such a point that not only would there be no profit in the sale of lamps, but that the quality of the goods themselves would suffer in proportion.

There is no question that there are many who have always considered the lamp trade as a sort of commercial gold mine, only needing their particular talent and enterprise to reach its richest development, and that all they had to do was to commence manufacturing to open the gates through which the golden stream would flow.

It is needless to say that this class of enthusiasts had no closer connection with the industry than that afforded by their vivid imaginations, and that their ideas were based principally on an utter ignorance of the real requirements of the business.

The days when immense fortunes were to be made in incandescent lamps, as in sewing machines and bicycles, are past, and the time has come when the industry must settle down to strict business principles and follow the well-defined lines of all commercial staples.

It is by no means to be inferred that the lamp business is on the decline or that there is no longer any money to be made in it; on the contrary, the real development of the industry is but fairly begun, and its future depends on the manufacturers themselves.

Prices at the present time are low, too low in some instances to insure a first-class quality in the output, and the manufacturer who rushes in with the expectation of securing all the trade at cut rates, and sacrificing quality in the effort to do so, injures himself and the industry with which he is identified.

It has long been demonstrated, with a few exceptions, such as the Standard Oil and the Sugar Trust, that no one man or set of men can control the market on a public commodity, and the lamp manufacturer who undertakes to do so, by selling at a ruinously low price, will have but a brief existence.

Among discriminating consumers, and they are increasing rapidly, first cost is not the sole consideration by any means, and the manufacturer who turns out a good, honest lamp at an honest profit will always secure a fair percentage of trade, provided he conducts his business on business principles and pushes his goods with snap and confidence; and in nine cases out of ten he will live to read the obituary over his "sell below cost" competitor.

Bearing this in mind, and backed by experience and the sound common sense characteristic of the American business man, it seems there is little call for lamentation over present prospects or doubts as to the future.

NIKOLA TESLA.

Tesla's loss by fire, while a serious one, has not prostrated the talented inventor, as the accounts in the daily press imply. Instead he goes to work with renewed vigor, replying to a friend, who suggested that he take a long rest before starting in again, that "I might have followed your advice and taken a rest if this had not occurred, but now I feel that it is about time to stop idling." Tesla never was an idler, and if he works any harder now than before, he will have to find the way to live without stopping to eat or sleep. The kindly tone of the great dailies in speaking of the young inventor's loss is particularly noticeable. We do not remember ever having seen a higher compliment paid anyone than the following from the *Sun* of this city, evidently by Mr. Chas. A. Dana:

The destruction of Nikola Tesla's workshop, with its wonderful contents, is something more than a private calamity. It is a misfortune to the whole world. It is not in any degree an exaggeration to say that the men living at this time who are more important to the human race than this young gentleman can be counted on the fingers of one hand; perhaps on the thumb of one hand.

The ELECTRICAL REVIEW extends to Mr. Tesla its regrets over his most exasperating loss, but with everyone else interested in scientific progress is glad to note his resolution to at once take up his work so near completion. May health and strength and greater success and honor be his!

Wall Street and the Electrical Stock Market.

The week in the stock market was moderately active and chronicled some improvement. A better feeling abroad over the more tangible turn taken by our currency affairs, and at home through a moderate though slight improvement in almost every branch of business, was reflected in higher prices for stocks and an excellent demand for bonds. Two railroad companies reduced their dividends; St. Paul from two to one per cent for the half year, and New York Central from 1¼ to 1 for the quarter. These actions were expected, had but little effect upon prices and were regarded as a conservative policy which would be a winner in the end.

It would pay the business man from now on to devote considerable attention to the trade reviews. Business has evidently turned in its long downward course and started to climb toward prosperity. The ascent will be painfully slow but in an equal degree sure. Bank clearances and railroad earnings show moderate increases. There is a better demand for staples; railroad earnings are picking up and certain great industries, notably the woolen and boot and shoe trade and the iron and steel business report a fair improvement. Factors of great importance in their bearing upon the future are the advances in wheat and cotton which have added to the purchasing power of the farmer and planter.

In electrical stocks the strength of General Electric and Westinghouse somewhat colored the story circulated by a morning daily. The assertion was that all the electrical companies in the United States, not forgetting the new storage battery concern and the Niagara Falls Power Company, were to be bought up by Standard Oil capitalists. Since the Standard Oil Company began to make money its owners have been recklessly charged with being identified with or negotiating for every form of enterprise from a 1,000 acre mosquito farm on the Jersey coast to tunneling the Rocky Mountains.

The story in question is on a par with that of another contemporary who recently suggested that Tesla was working on a scheme to turn an electric current loose into the air at Niagara Falls and draw it off at New York city. It will be in order for both these publications to solemnly assert that the burning of Tesla's laboratory has postponed the consolidation.

It might be incidentally remarked that Mr. George Westinghouse and General Electric officials have denied that a consolidation is contemplated. The Westinghouse company is perfectly satisfied with what it has. The General Electric Company is satisfied that it has had too much, and has been trying for two years to consolidate its various branches at Schenectady and Lynn, as idle plants at various points in the country will testify.

It is just probable that a few of the Standard Oil people are taking an interest in the Electric Storage Battery Company, an exceedingly promising concern, and this may be the basis of the report as outlined.

Well-informed interests are inclined to view the advance in the stock of General Electric as warranted by conditions. They say it has been unduly depressed and that it is worth more money than it commands at present. The low point was 26½ on Monday. The high figure was 30⅝ on Friday. The debenture bonds gained 2½ points, closing at 89½.

The Western Union declared a quarterly dividend of 1¼ per cent payable April 15. The net earnings for the quarter after interest and sinking fund charges were $956,600. The dividend paid was $1,192,000, leaving a deficit of $235,400. Never but once in its history has the company earned its full dividend during the March quarter. The surplus after dividends for nine months was $298,008.

The Edison Electric Illuminating Company of New York declined from 96¼ to 94½. Transactions were few. The bonds sold from 105½ to 106. The stock of the Edison company of Brooklyn was not quoted. The Edison company of Brooklyn has declared a dividend of 1½ per cent for the quarter, payable April 15. Books close March 31 and reopen April 15.

The American Telegraph and Cable sold at 89½ to 90. North American fluctuated around 3¼. This company, through its Milwaukee subcompany, owns the exclusive franchise for lighting that city. It expires in November. An official informs me that he expects that it will be renewed on favorable terms.

Westinghouse securities were firm to strong. The common stock advanced to 31½ bid and 33 asked. The preferred was quoted at 50½ bid and 51 asked. The company declared a quarterly dividend on the preferred of 1¾ per cent, payable April 1. Books close March 21 and reopen April 1. President Westinghouse, in speaking of the company's future, says that the new works at Brinton have been opened and that he feels confident as to the position of his company in respect to any existing competition.

The American Bell Telephone Company's stock was firm at 191. The company declared the regular quarterly dividend of 3 per cent, payable April 15. Books close April 1 and reopen April 14.

On the Boston Exchange Erie Telephone was strong at 49¾ to 51. General Electric preferred advanced from 60 to 65. New England Telephone advanced from 67 to 68. Telephone stocks show decided gains in a month. Bell Telephone was the only exception. This was due to the Bate decision. New York and New Jersey is higher than it has been in months.

The following is a comparison of telephone stocks:

	March 16 Bid.	March 16 Asked.	February 16 Bid.	February 16 Asked.
Bell	191	191½	190⅜	191
Erie	50	50½	46	46½
Hudson River	40	45	42	47
Mexican	70¢	75¢	50¢	65¢
New York & New Jersey	103	105	98¾	100

Of the inactive telegraph and electric stocks the following comparisons are made:

	March 16 Bid.	March 16 Asked.	February 16 Bid.	February 16 Asked.
Ed. Ill. Brooklyn	106	107	109	110
Ed. Ill. Boston	125½	126	123	125
El. Storage Battery	29¾	....	....	....
El. Stor. Battery pfd.	29¾	....	....	....
Int. Cond. and Ins.	41	43	35	40
Cent. and S. Am. Cable	117½	122	117½	122
Commercial Cable	137	...	134	....
Gold Stock	104	....	104	....
Int. Ocean Telegraph	104	....	104	....
Mexican	179½	190	179½	190
Postal Tel. and Cable	62½	....	55	58
Southern and Atlantic	85	90	85⅝	87¾

BAIN.

New York, March 16, 1895.

THE BATE DECISION.

BY CHARLES A. BROWN, IN "ELECTRICAL ENGINEERING."

On March 4 the Supreme Court handed down the decision in what is known as the "Bate" case. This decision settles the construction of Section 4887 of the Revised Statutes of the United States, which is as follows:

SEC. 4887. No person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been first patented or caused to be patented in a foreign country, unless the same has been introduced into public use in the United States for more than two years prior to the application. But every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than 17 years.

Ever since this statute was enacted in 1870 the interpretation by the courts has been that the life of the United States patent was limited by the life of the shortest foreign patent on the same invention to the same inventor, which was granted prior to the issue of the United States patent. This would seem to be the plain and unambiguous language of the statute, but a learned and elaborate argument was prepared to show that what was meant as the limiting date was not the date of the issue of the United States patent, but the date of its application.

Many United States patents, some of them of great breadth, have been issued subsequent to the dates of foreign patents upon the same inventions and to the same inventors, which foreign patents, however, have been taken out subsequent to the dates of the applications for these same United States patents. This arises from the delays which often ensue between the date of application of the United States patent and its date of issue.

If it could have been shown that foreign patents taken out at any time subsequent to the date of the application of a United States patent would not limit the life of that United States patent, then these broad patents—among which are the quadruplex telegraph patents, the much-litigated incandescent lamp patent, the multiple arc patent No. 369,280, the broad socket patent, the Edison carbon telephone patents, and others—would have been given a new lease of life. For example, the multiple arc patent No. 369,280 was granted in 1887 upon an application filed in 1880. It was broad enough to cover practically every incandescent electric light plant and every plant for the transmission of power in the United States, and would have lasted until 1904, except for its limitation by the expiration of the foreign patent. The incandescent lamp patent had still about two years to run, but this decision in the Bate case gives it its quietus. The carbon telephone patents of Edison, which are owned by the American Bell Telephone Company, were second only to the Berliner patent in breadth. As the Berliner patent has been declared void, the decision in the Bate case removes the last legal obstacle to the making of carbon transmitters, except certain special forms. It should be born in mind, however, that the Berliner patent may yet be sustained by the Circuit Court of Appeals.

This decision, therefore, clears the field and is of great advantage to electrical interests. The sufferers are the most powerful companies connected with electrical interests, and the advantages arising from the decision will flow to all who use and to all who are engaged in supply or manufacturing business outside of the large concerns mentioned.

While the decision seems to be in accordance with the plain meaning of the statute, the statute itself is open to serious objections and should be amended or repealed. It is a matter for congratulation that the Supreme Court has left this duty to that branch of the government which has the responsibility of making new laws relating to patents—Congress.

The Chicago Cosmopolitan Electric Ordinance.

The Chicago Common Council has just passed, what is rumored to be, a boodle ordinance called the "Cosmopolitan Electric Ordinance," which may create a formidable opponent to dispute the territory of the Chicago Edison Company. This ordinance has been pronounced defective by prominent lawyers, and is now being discussed, and will in a few days be determined by the courts to be good or bad. The councilmen are said to have over-reached themselves, and granted so much that the ordinance was manifestly questionable, and thought to be technically illegal. Chicago's Mayor, John P. Hopkins, is charged with being in the deal, as he signed and approved the ordinance, contrary to the sentiment of all the Chicago newspapers and an indignation meeting of the Civic Federation, held at one of the principal theaters.

Even though the ordinance is passed and approved by the courts, it seems that the new company might have a hard time, since the Chicago Edison company now makes light and power as cheap as any company in the United States, and has the wires and conduits and the patrons to use its product, and is backed by some of the strongest men, financially, in the city. The company has hitherto crushed out all competition by cheapening the cost of light and power, and has now one of the best and most modern plants in existence.

This cosmopolitan ordinance, it is said, was meant to be sold to the Chicago Edison company, but the company claims never to have paid a dollar for political pulls or sandbags, and its officers say it never will.

Electric Railway Consolidation in Connecticut.

A press dispatch says that the Consolidated Railroad Company is said to be formulating plans to purchase several trolley railroads along its lines in Connecticut, including the Bridgeport Traction, the Norwalk Tramway, the Westport and Saugatuck Horse Railroad Company, the Westport and Southport Tramway Company and such other street railroads along its lines, the control of which will best serve Consolidated interests. The Consolidated, it is said, has become convinced that the extension of electric roads under old charters and under new ones, for which so many petitions have been presented to the legislature, will parallel its lines to such an extent as to affect its income from short-distance traffic. To fight all these roads, it was found, would be expensive. Favoring the petitions for charters of such as could best be dealt with and buying such others as it needed, it was thought, would be the best method of continuing to hold the carrying trade in Connecticut.

Three roads in the vicinity of Norwalk will soon pass into the control of the Consolidated. The Westport and Saugatuck Horse Railroad Company, with a capital stock of $15,000, divided into 150 shares, has accepted a proposition from the Consolidated which includes the purchase of the stock of the company at par, provided the legislature allows the company to use electricity. The agreement to sell at par was made by four directors of the Westport road, Horace Staples, Edward H. Nash, Andrew C. Nash and William G. Staples. With the Westport and Southport Tramway Company the agreement is that the Consolidated will aid it to obtain the electrical clause to its charter, with the view, of course, of controlling it when secured.

In regard to the purchase of the Norwalk Tramway system, George N. McKibbin, vice-president of the Tramway, told a reporter that he could make no statement about the proposed deal. He was not at liberty to affirm or deny that negotiations were under way. George W. Mansfield, secretary and treasurer of the road, said that the matter had been broached to him informally. The early extension of the Norwalk Tramway Company's lines from East Norwalk to the Westport and Saugatuck company's lines at Saugatuck will make, when the Westport and Southport Tramway Company's lines are established and the Norwalk Tramway Company finishes extending its lines to Stamford, a splendidly equipped electric line parallel to the Consolidated Railroad between Stamford and Stratford, a distance of 30 miles. It is said that the Consolidated company pany will not stop there. If it is profitable to employ electric lines as feeders between Stamford and Stratford, its officers argue, it should also be profitable over most of the distance between New York and New Haven.

ELECTRIC RAILWAY NOTES.

Officers of electric railway companies are requested to send promptly to the ELECTRICAL REVIEW *notices of meetings, election of officers, declarations of dividends, financial reports and all items of interest in connection with the financial and practical operation of their roads.*

The electric railway at Jacksonville, Fla., is now in operation.

Numerous improvements are contemplated by the Springfield, O., Electric Railway Company.

The electric railway between Mt. Carmel and Centralia, Pa., is to be completed just as soon as the weather will permit.

The McKeesport and Wilmerding, Pa., Street Railway proposes to push work, and by June 1 have its line finished from McKeesport to Brinton.

The Milwaukee, Wis., Street Railway Company is experimenting with two 40-foot cars. By close crowding 100 passengers can be carried on each car.

John H. Devine, electrician for the Johnstown, Pa., Passenger Railway Company, has invented an automatic breaker alarm for electric railway circuits.

The Lincoln Electric Street Railway Company has given a mortgage to the St. Louis Trust Company for $50,000 on all their personal and real property to pay a floating indebtedness.

The New York, Elmsford and White Plains Railway Company has accepted the franchise granted by the board of trustees to operate an electric street railroad through White Plains, N. Y.

The Nassau Electric Railroad Company, of Brooklyn, N. Y., expects to have its line running from the foot of Broadway, Williamsburgh, to Canarsie by Decoration Day. The fare for the trip is fixed at five cents.

The Los Angeles Consolidated Electric Railroad Company has been taken possession of by the bondholders on account of default in payment of the half year's interest on the $3,000,000 bond issue due last September.

The bill which has been presented in the New York Legislature requiring elevated railroad companies in cities of more than 1,200,000 inhabitants to equip their passenger cars with the most improved system of lighting now in use applies only to New York city. It prohibits the use of oil lamps after June 1 of the present year.

The following is a statement of the operations of the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., for the quarter ending December 31, 1894:

Gross earnings from operation.....	$1,110,442 33
Operating expenses, exclud'g all taxes.	714,791 46
Net earnings from operation.....	$395,650 87
Income from other sources than operation.....	56,369 11
Gross income from all sources.....	$452,019 98
Fixed charges, including all rentals...	526,986 94
Net income from all sources (deficit).....	74,966 96

The Watertown and Brownville, N. Y., Street Railway Company has filed its report with the Railroad Commissioners for the quarters ending September 30 and December 31 last. It shows the net earnings of the road to be $3,734. The liabilities of the company are put down at $236,497 and the assets at the same amount.

A stock company has been formed composed of Chicago, Valparaiso, Ind., and Hobart capitalists to build an electric road from Valparaiso to Chicago. The cars will be constructed so that light freight can be shipped. The principal backers interested are milk shippers, whose daily business through that territory amounts to hundreds of dollars.

If the new system of transporting the mails between the main post office in Boston and the outlying districts, the sub-stations and the railway stations meets with departmental favor, the West End Street Railway Company stands ready to place in commission a dozen or more cars conveniently equipped and distinctively characteristic of the duties they will be called upon to perform.

The electric railway at Marion was sold on March 14 by order of the United States Circuit Court in the suit brought by the Metropolitan Trust Company, of New York. Warren McWhinney and Charles R. Holderman were the purchasers. They hold $60,000 of the railway company's bonds, and got the property, which cost $53,000, for $30,000. Russell B. Harrison, it is reported, has $10,000 of the bonds, and the remainder of the $75,000 bonded indebtedness is held by New Yorkers.

Edison on Argon.

Argon, the new element which is said to have been discovered in the atmosphere, and mention of which was recently made in the ELECTRICAL REVIEW, has attracted the attention of Thomas A. Edison. To a reporter he expressed himself as follows:

The discovery of argon is a fresh evidence of how very little we really know. Here is a constituent existing in the atmosphere to a considerable percentage, and yet the air has been analyzed and analyzed for more than 50 years without its presence being suspected. The investigators would withdraw the carbonic acid and the oxygen and say that what was left was nitrogen. Somebody finally noticed that this nitrogen possessed slightly different properties from pure nitrogen obtained in other ways, and the result was that argon was discovered. My investigations will be made in connection with my incandescent lamp. Phenomena take place in the lamps which cannot be explained except on the hypothesis of a new element in the atmospheric residuum left in the bulb. Whether argon is responsible for them or not, I don't know, but I shall try to find out. It seems, from investigations already made, that argon is a perfectly inert gas. It has not been found to unite with anything, I believe. It is possible, however, that it may unite with incandescent carbon. If it isn't argon that attacks the filament, it may be something else which hasn't been discovered yet.

ELECTRIC LIGHT FLASHES.

G. C. Danforth has commenced to erect a new electric light plant at Washington, Ill.

At a recent election the people of Tamaqua, Pa., decided by a large majority to build a borough arc light plant.

S. D. Purdy has been elected president of the Batavia, N. Y., Electric Light Company, in which he owns a large amount of stock.

The Edison Electric Illuminating Company of Brooklyn, N. Y., makes the following comparative statement for February:

	1895	1894	Inc.
Gross.....	$42,412	$32,866	$9,545
Net.....	19,380	17,667	1,713
Net for dividends...	17,280	15,567	1,713

The Edison Electric Illuminating Company of New York, makes the following statement of comparative earnings for February:

	1895	1894	Inc.
Gross...	$143,588 17	$124,058 24	$19,529 93
Net.....	74,909 11	72,985 64	1,923 47
Two Months.			
Gross...	$310,541 22	$259,242 52	$51,298 78
Net.....	168,612 25	149,829 17	18,783 00

The bids for the cost of the Milwaukee, Wis., City Hall electric plant were opened by the Board of Public Works last week, but were rejected. Only three were made and they were considered excessive. The bids were: E. G. Bruckman, $39,856; Western Electric Company, $43,000, $36,718 and $40,550; General Electric Company, $39,687, $45,080 and $38,262.

An examination of the books of the Kansas City Electric Light Company has developed the fact that the company has been systematically robbed of several thousand dollars during the past few years. The exact amount cannot be told until an expert, who is at work on the books, makes his report; but it is said to already approximate $6,000. A. J. Coulter, who has been bookkeeper for the company since 1889, is accused of being the embezzler. He was arrested, but released on $5,000 bail, and is said to have admitted his guilt. Manager Weeks said that he had positive proof that Coulter and an accomplice named Hill between them had stolen $8,400 in the past three years.

Death of Henry C. Thom.

Henry C. Thom, chairman of the State Republican Committee of Wisconsin, died in Madison, in that State, on March 16. His breakdown was due to overwork during the last campaign. Mr. Thom was interested to a considerable extent in the electric lighting industry and had been prominently connected with the Northwestern Electrical Association. Last year he was secretary of the association and at its annual meeting in Milwaukee on January 16, 17 and 18, 1895, Mr. Thom was elected president, which office he held at the time of his death.

General Electric Company's Annual Meeting.

The annual meeting of the General Electric Company will be held a month later this year than last year. It will be held at Schenectady, N. Y., May 14, as against April 10 last year.

EGYPT WELCOMES ELECTRICITY.

OLD FATHER NILE TO BECOME ONCE MORE THE SAVIOUR OF MODERN EGYPT.

To the Editor of Electrical Review:

That the world, progresses and at a pretty rapid gait, can no longer be denied. At the *fin de siecle*, a phrase which of late has rather infested our newspaper columns, the electrical engineers will point at the subjugation of the Niagara Falls as the most important achievement of modern science, a witness of the world's progress far more eloquent than all the volumes of scientific literature which adorn our libraries.

And indeed we have some reason to believe that the future generation of men will not contempt the work of the present race of men, nor apply to us in the famous, or, if you please, infamous, lines of Horace, *Aetas avorum, pejoravis*—our fathers were not equal to their ancestors.

While it is true that the Yankee spirit so far has been in the van of civilization, there has recently been unfolded to the world a scheme which, in regard to the vastness of its social-economical consequences, bids to outshine anything that has been accomplished in the United States.

The author of this grand enterprise is M. Prompt, Inspector-General of Bridges and Ways, and Administrator of the Egyptian Railways. At the last meeting of the Egyptian Institute (December 28, 1894) in Cairo, he read a paper of which the following is a short resumé.

Since 1882 it has been known that the agricultural products of Egypt—once the famous granary of Rome—are steadily decreasing. Accurate statistics prove a decrease from 30 to 40 per cent during the last decade. In fact, it has become necessary to cultivate cotton and cane sugar instead of wheat. Some time ago English engineers proposed to create a large reservoir in Upper Egypt whence the necessary water might be drawn to irrigate the soil, but on careful investigation it was found that such a plan could not be carried out successfully. Encouraged by the commercial results of the Frankfort-Lauffen installation, M. Prompt conceived the idea of utilizing the famous cataracts of the Nile, and for this purpose he has devoted much time and attention to a careful scientific investigation of the problem. The result of his labors is the following scheme, which is to be realized in the near future.

M. Prompt proposes to construct near Assouan an artificial cataract of 15 metres head, which, while permitting the storage of 500,000,000 cubic meters* of water for irrigating purposes, permits on the other hand the utilization of 40,000 horse-power. A second cataract of five meter-head shall be constructed near Cairo. If this project is realized a horse-power can be furnished for two centimes per horse-power hour, sufficient to operate 130 cotton establishments containing 2,000,000 looms, giving occupation to 40,000 workmen, and using 100,000 tons of cotton. M. Prompt states that the entire work would not exceed 40,000,000 francs, netting 40 per cent dividends.

He also showed that the execution of his plan would speedily transform the prevalent social-economical conditions of Egypt, because with the surplus water 280,000 hectares might be irrigated for the cultivation of cane sugar, producing 450,000 tons of sugar. One-half of the cotton raised would be consumed in Egypt, and within three years the Egyptian cotton trade would outrival that of any other country of the world.

It is to be noted that the author of this rather more than ingenious scheme is one of the leading French engineers, a man who is fully able to verify his figures and statements.

V. M. Berthold.

March 13, 1895.

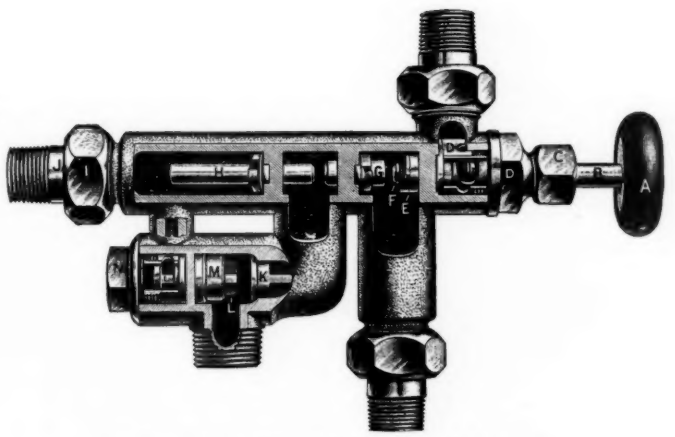
* 1 cubic meter=2,204.6 pounds.

The "Standard" Dictionary.

The second and completing volume of Funk & Wagnalls Standard Dictionary of the English Language has been issued by the publishers, the Funk & Wagnalls Company, 30 Lafayette Place, New York city. When it is stated that this dictionary required 247 editors and specialists working five years at an expense of $960,000 before a completed copy was ready for the market, the thoroughness and comprehensiveness of the work may be appreciated. It is a grand achievement in lexicography, and will doubtless remain for many years what its name implies, the standard dictionary.

A New Injector.

We illustrate herewith a new injector for which the makers claim most remarkable and wonderful results. During the past few years a great number of automatic injectors have been put on the market, but in the main features and methods of operation they have in great measure copied one another and none of them have been able to produce better results than others which have gone before. Up to the present time automatic injectors have been limited in their range, as it has always been found impossible to retain the automatic qualities and at the same time handle a hot water supply or give the injector a greater range than 120 pounds to 130 pounds between highest and lowest steam pressures. The positive injector reached its limit 15 years ago, and while it has secured better results on hot water than the automatic injectors, yet a first-class positive injector is high priced and requires considerable attention from the operator.



Figs. 1 and 2.—The "International" Injector.

The "International" injector is a new departure, being based on new principles, by virtue of which it combines all the good features of both automatic and positive injectors of the past and surpasses both in working qualities. The principal new feature in the "International" is the fact that the current of water to the boiler is established against atmospheric pressure instead of against direct boiler pressure as heretofore. This is accomplished by the combination of overflow valve K and pressure valve L. When the injector starts, the steam passing through the steam jet F and suction jet G passes down through the overflow chamber, forcing valve K and L away from their seats and opening the passageway through the overflow for the escape of steam, which, by its pressure against the valve H, holds both valves away from their seats. A vacuum being created between jets F and G the water is lifted, and passing through the suction jet G and combining and delivery jet H on its way to the boiler, passes down through the secondary overflow, and out through the passage ways between pressure valve L and pressure valve collar M. As the pressure increases in the delivery chamber around the delivery jet H, valve L is gradually forced to its seat against the collar M, but does not finally close until the current to the boiler is firmly established. The valve K in the meantime is closed by the vacuum in the overflow chamber. By a new construction of the parts in the steam chamber the same valve handle A opens valve admitting steam to the injector and at the same time regulates the amount of water supply, therefore, no valve is required in the suction pipe, nor is one necessary in the steam pipe, except as a convenience should it be desired to remove the injector at any time while carrying steam on the boiler.

Another new feature is the fact that the combination and delivery jet H has no spill holes and will, therefore, outwear three of any other make. The makers claim for this injector that it will start at 13 pounds to 15 pounds steam pressure and work from that point up to 250 pounds steam pressure, giving it a range of 235 pounds, which is 100 pounds greater than any other automatic injector. It is automatic and restarting at any and all pressures. It lifts the water vertically 20 feet to 22 feet and handles a hot water supply of 135 degrees at 65 pounds to 80 pounds of steam, 125 degrees at 125 pounds of steam. By delivering the minimum capacity it will put water into the boiler at 200 degrees at 80 pounds of steam, and at 260 degrees at 150 pounds to 200 pounds of steam, the water being taken from a four-foot lift at 74 degrees. One of the most remarkable features about this injector is its grading capacity. The best injectors heretofore manufactured have a grading capacity of only about 40 per cent to 50 per cent, while the minimum capacity of the "International" is 66⅔ per cent less than the maximum capacity of the same size. The parts are made interchangeable and are all easily accessible for cleaning, and the injector is fully guaranteed. It is manufactured by the World Specialty Company, of Detroit, Mich., who will be pleased to send descriptive circulars and price list to anyone inquiring for them.

A merchants' electric light company has been organized at East Liverpool, O., with a capital stock of $20,000 to contest the field with the Cerenamic City Light Company.

TELEPHONE NEWS AND COMMENT.

A telephone war is on in Niles, Ohio, and rates have dropped from $50 to $18 per year.

The Strowger automatic telephone exchange device is to be used by the new telephone company at Dunkirk, Indiana. They have contracted with the Indiana Telephone and Construction Company, of Frankfort, Indiana, to construct the exchange.

The American Bell Telephone Company, on March 13, declared its regular quarterly dividend of $3 per share, payable April 15. Books close April 1 and reopen April 15. No extra dividend was declared. Books for the annual meeting on March 26 close March 21 and reopen March 27.

The American Telephone and Telegraph Company, of New York city, on March 12 filed with the Secretary of State a certificate of increase of its capital stock to $12,000,000. The amount of capital of the company actually paid in is $7,500,000, and the whole amount of its debts and liabilities is $3,019,005.

The New England Telephone and Telegraph Company will build a new line from Cherryfield to Machias, Me., and the lines from Portland, Me., into the White Mountain region will be rebuilt and improved. The lines between Keene, N. H., and St. Johnsbury, Vt., and Rutland and Burlington, Vt., will be rebuilt with metallic circuits.

The reductions made by the new rates of the New England Telephone and Telegraph Company are as follows: Unlimited party lines, business, from $75 to $66; residence, from $60 to $51. Two-party lines, business, from $81 to $75; residence, from $66 to $60. Grounded lines, unlimited, from $52 to $48; two-party, from $58 to $54. Residence special circuit, unlimited, from $40 to $39; two-party, from $47 to $45.

The Bell Telephone Company has never declared an extra dividend in March, says the Boston *News Bureau*. The first extra dividend was three per cent in December, 1884. In 1885 the company paid two per cent extra in July and two per cent extra in November. In 1886 and 1887 four per cent extra was paid in August. In 1888 the company paid an extra dividend in August of six per cent. In 1889, 1890 and 1891 the company made its extra dividend, $6, payable in July, but in 1892 the directors recognized that, with the expanding capital, this was too large a division for one season, therefore, in July, 1892, the company paid an extra dividend of $3 per share, and $3 extra January, 1893. In July, 1893, and January, 1894, the company paid $3 extra; in October, 1894, one and one-half per cent, and in January, 1895, one and one-half per cent.

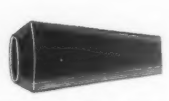
Electrose Specialties.

Electrose is one of the most successful substitutes for hard rubber in the market. It is now in daily use by many of the leading manufacturing concerns, as well as by the jobbing trade, throughout the country in the shape of telephone receiver cases, mouthpieces, handles, socket bushings, keys, etc., and a great number of insulating specialties. Electrose is claimed to be a perfect insulation and can be moulded in almost any shape desired. It is said to be a great deal cheaper than hard rubber. It can be furnished in any color desired and it will not lose its original color. Furthermore, it will

TELEPHONE RECEIVER.

TELEPHONE MOUTHPIECE.

REDUCING NIPPLE.



TELEPHONE BELL HANDLE.

SOCKET BUSHING.

SOME ELECTROSE SPECIALTIES.

not tarnish metal that must needs be in contact with it in electrical work, because no sulphur is used in vulcanizing electrose. The material is the invention of Mr. Louis Steinberger, the president of the Electrose Manufacturing Company. The concern is located at 214 and 216 William street, New York, and has a floor space of 15,000 square feet with an ideal plant for the prosecution of its labors. For the last two years electrose has forged its way gradually ahead and is now an established factor in the electrical trade.

The Kinetoscope-Phonograph.

The combination of the kinetoscope with the phonograph, upon the perfection of which Thomas A. Edison and his assistant, William K. L. Dickson, have been working for several years, is said to have been made practical, and will be offered to the public within a short time in the shape of an instrument which will show action and give phonetic expression synchronously.

American Institute of Electrical Engineers.

The Ninety-fifth meeting of the Institute will be held at 12 West Thirty-first street, New York city, on Wednesday, March 20, at 8 P. M. A paper will be presented by Prof. Harris J. Ryan, of Cornell University, and Mr. Milton E. Thompson, entitled: "A Method for Preventing Armature Reaction."

PERSONAL.

Mr. G. G. Luthy, of the Royal Electric Company, Peoria, Ill., is visiting New York.

Mr. J. B. Wallace, of the Wallace Electric Company, Chicago, was in New York last week.

Mr. W. B. Cleveland, of the Forest City Electric Works, Cleveland, O., is taking a vacation in Florida.

Mr. B. F. Miles, of the National Carbon Company, Cleveland, was among the visitors to New York last week.

Mr. C. H. McIntire, of the C. McIntire Company, Newark, N. J., is expected to return from Florida the latter part of March.

Captain W. L. Candee, of the Okonite Company, Limited, New York city, has returned from a brief vacation at Old Point Comfort.

Mr. James P. McQuaide, secretary and treasurer of the National Conduit Manufacturing Company, of New York, accompanied by his wife left last week for a month's vacation in Florida.

Mr. E. H. Phipps, president of the Connecticut Pipe Manufacturing Company, of New Haven, Conn., visited New York last week and put up at Mr. Ed Stokes' tavern, the Hoffman House.

Mr. W. A. Stadelman, New York manager for the Elwell-Parker Electric Company of America, of Cleveland, has chosen offices at Room 715, Havemeyer Building, where he is cozily located and ready to welcome his many friends.

Mr. George F. Sandt, of Westfield, N. J., has resigned his position as secretary and treasurer of the Electrical and Mechanical Engineering Company, of New York city. Mr. Sandt states that he intends to remain in the electrical field.

Mr. Robert H. Read, of the firm of Pope, Read & Rogers, patent solicitors, 39 Cortlandt street, New York city, reports great activity among the new telephone manufacturing companies over the patent situation. Mr. Read has made a special study of the intricate questions involved in the telephone patent situation and his opinion in matters of this kind is highly regarded.

Mr. William McKenney, of McKenney & Waterbury, Boston, Mass., passed through New York last week, on his way to Bermuda, and favored the ELECTRICAL REVIEW with a pleasant call. Mr. McKenney's firm is one of the largest and best known manufacturers of artistic gas and electric light fixtures and has installed some of the handsomest work ever seen in New England.

Mr. R. B. Corey, who last week announced that he had established himself as a manufacturer of arc lamps, has made an arrangement whereby he becomes the general sales agent for the General Incandescent Arc Light Company, of New York. Mr. Corey will handle the full line of Bergmann arc lamps and the Knight arc lamps, all of which will be manufactured by the company named. A full line of imported carbons will also be carried. Mr. John C. Knight, inventor of the Knight arc lamp, will be associated with Mr. Corey, who will retain his offices at Room 715, Havemeyer Building, New York, where arc lamps for any and every service may be obtained.

LITERARY.

In the *Political Science Quarterly* for March, Prof. W. J. Meyers reports an investigation of the cost of "Municipal Electric Lighting in Chicago."

A talk with the author of "Trilby," Mr. George Du Maurier, wherein with the same frank kindliness and good-fellowship that have made "Trilby" the most popular novel of the period, he tells the story of his adventurous life, and how he became an artist and, later, a novelist, and how he draws and how he writes, will appear with portraits and other pictures in *McClure's Magazine* for April.

Scribner's Magazine for April will be an Easter number with a special cover designed by Henry McCarter and a series of full-page pictures by four great illustrators—Edwin A. Abbey, Albert Lynch, W. T. Smedley and Edwin Lord Weeks—showing Easter scenes in England, Paris, New York and Jerusalem. There is also an Easter hymn with six remarkable full-page symbolic pictures by Henry McCarter.

"On the Development and Transmission of Power from Central Stations," by William Cawthorne Unwin, F. R. S. Cloth, 312 pages, 81 illustrations. Longmans, Green & Company. Price, $3.50. Sent postage free on receipt of price by the ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

The present work is a revised extension of the Howard lectures delivered before the Society of Arts, London, by Professor Unwin in 1893. The author has treated his subject as a whole and therefore has discussed the causes of waste in generating power as well as the losses in distribution. He has indicated what is essential in the consideration of projects of power distribution from any source and by any method of transmission.

The Chicago Edison Company.

The increase of capital stock of the Chicago Edison Company from $2,625,000 to $3,000,000 was consummated on March 15, each holder of stock having the right to subscribe to one-eighth of the number of shares he held, at par, the new stock bearing dividends at eight per cent, the same as at present paid.

This limits the amount of stock of the company, which is now fully paid, as the chartered capitalization of the company is $3,000,000. Any further money to be expended by the company on betterments must be obtained by the sale of bonds. It has no mortgage bonds at all, and only about a quarter of a million debenture bonds at 103, last sale price.

NOTES ON RECENT ELECTRICAL ENGINEERING DEVELOPMENTS IN FRANCE AND ENGLAND.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK AND CHICAGO, FEBRUARY 27, 1895, BY H. WARD LEONARD.

INTRODUCTION.

As a result of inspecting some of the most interesting of the developments in the field of electrical engineering during a recent trip to France and England, and, as a result also of having met many of the engineers responsible for these recent developments, I find it difficult to reach a conclusion as to whether we or our contemporaries across the water are ahead in the electrical engineering race.

Of course, when one attempts to compare the electric developments of the respective countries commercially, we are in the same position as the "America" was in the historic yacht race—"there is no second;" but, considering the recent electrical development from an engineering standpoint, we are rapidly losing the lead we have thus far held.

Although I have always felt that so-called fundamental patents and the resulting enormous aggregations of capital and engineering talent under one management were a millstone around the neck of our profession, I have never before had the opportunity of seeing positive and unmistakable evidence of it such as this visit abroad showed me.

In the beginning of electric lighting, both arc and incandescent, we led the world from an engineering standpoint, and were years ahead of any other country. But, what has been done in this country in the way of a remarkable electrical engineering development since Edison started his first three-wire system at Sunbury, Pa., in July, 1883, and Westinghouse established his alternating system with 1,000-volt primary and 50-volt secondary a few years later, and Sprague started the Richmond electric road? A moment's thought will, I think, make you all realize that the practical development of electrical engineering improvements is almost impossible against the opposition of the gigantic corporations in that field, and that corporations having such a large portion of their capital represented by patents will not wish to see the practical trial of a promising improvement which they do not control, and which may depreciate the value of the methods they control or claim to control. It is in just this way that we are losing ground when compared with England and France.

We undoubtedly have the best three-wire central station plants in the world, also the best alternating system converting from 1,000 to 50 volts. But what other kind of central stations have we to point to? Practically none.

We have 500-volt continuous current electric railways galore, and we operate such railways at distances for which 2,000 volts should be used instead of 500, and after investing more money in copper per car than the entire cost of the electrical equipment, we still lose twice as much energy as is commercial in the line.

Is there a large electric railway system in this country which as an electrical transmission of power is a credit to our profession? Not one.

In France, and even more in England, one is forcibly impressed by the many kinds of central stations being tried. Many of them may seem almost sure to prove commercially unsuccessful, but who can say which one may not prove the "Sunbury" of an enormous electrical engineering development?

No capital or patents can prevent the slow development of evolution, but I fear that under the existing conditions we shall have to content ourselves with drawing pictures of what might be done, and watch the continued introduction of the three-wire system of 1883, the 1,000 to 50-volt alternating system of about 1887 and the continuous current 500-volt railway system of 1887, while our engineering friends abroad keep trying not only their own ideas, but the ideas of many of us from this side because they have the necessary encouragement and opportunity to do so, while we have not.

I have learned on this hurried trip abroad of many applications of inventions of American engineers which have proven very successful and which, although patented, described and advertised in this country, were taken up first by English or French engineers notwithstanding their well-known prejudice against American inventions.

ALTERNATING CURRENT PRACTICE.

In England one of the first things which impresses an engineer is the total absence practically of a 50-volt secondary for alternating systems. It is the general practice in England of late to use a three-wire secondary with 100 volts on each side. I believe that every engineer who has ever given the subject a thought, knows that there was no excuse except patents for a 50-volt two-wire secondary originally, and no excuse except the inertia and prejudice of large corporations for continuing to put in the two-wire 50-volt secondary to-day.

MANUFACTURING AND ENGINEERING.

In England there is a multitude of medium size concerns, manufacturing electrical apparatus, and the competition is mainly on ideas, and not the cost of dynamos per kilowatt. It is surprising to find that generators and motors are much cheaper in the United States than in either England or France, notwithstanding their advantages over us as to cheaper raw materials and labor.

The manufacturers abroad generally consider the consulting electrical engineers as entirely unnecessary in view of the multiplicity of schemes which every plant brings forth from the various manufacturers, but I believe that a great deal of benefit has been and is being accomplished in England by virtue of the custom of placing in the hands of good consulting electrical engineers the design, for instance, of a large central station plant to be built by a city itself.

Has a central station of this kind ever been built in this country? I think not; that is, a central station built according to advice from a good consulting engineer who was free to select the good features and eliminate the bad features of the various systems known to the art. Imagine a central station combining apparatus and methods of the General Electric, Westinghouse, and Siemens & Halske all in one system, also taking advantage of other good ideas from the United States and abroad. Who can doubt that it would be better than could be built by using only the patents and apparatus controlled by some one company.

Many will answer that all the best engineers are in the employ of the leading companies and the consulting engineers available are incompetent commercially, and there is a great deal of force in this argument; but even if true it certainly merely emphasizes the difficulty of getting a practical trial in this country of promising ideas in the electrical field unless they be controlled by one of the would-be monopolists.

ROTARY TRANSFORMERS.

Rotary transformers are used in several stations in England for a continuous current high potential multiple arc distribution, the secondary being a three-wire system as usual. Such a plant is in use at Oxford. At Brighton and several other places the standard 220-volt continuous current three-wire system is supplemented for distant lighting and in newly occupied territory by the alternating system using about 2,000 volts in the primary and a 220-volt three-wire secondary.

This alternating plant supplies the distant and scattered lighting during the period of heavy load, and during the period of light load (about three-quarters of the whole time) this distant lighting is supplied directly from the 220-volt three-wire system by switching the secondary circuit from the converter to the regular three-wire system.

Mr. Arthur J. Wright, who installed this system first at Brighton, spoke of it to me as an American invention not patented in England, a description of which he had read in the American electrical journals, and was much surprised to learn that none of the central station companies had made use of it in the United States, as it was proving of the greatest value to him in his plant.

STEAM ENGINES.

I believe we are ahead of England and France in the designing of dynamos and engines. Their workmanship leaves nothing to be desired, but giving consideration to amount of material used, efficiency and design, I think we are in advance of them.

One of the most surprising things to me was to see the almost universal use of engines which we would consider had practically no governor. That is, engines using slow acting throttling governors instead of the triumphs of engineering skill which are so common in this country. Not since 1883 have I seen such poor governors as I found generally used abroad in the finest and most recent stations, and upon engines which are almost perfection itself as regards manufacture.

THE PARSONS STEAM TURBINE.

The Parsons steam turbine was one of the most interesting things I saw in England. These steam turbines are direct coupled to dynamos, and in sizes of 350 kilowatts revolve at 3,000 revolutions per minute, and, of course, run at higher speed in smaller sizes. The space occupied by a 350-kilowatt outfit is over all about 25 feet long, five feet wide and, including governor, about seven feet high. These turbine plants when running at these high speeds are entirely free from vibration and are not even bolted down, but are supported by three pedestals, one near each end and one at the middle. There are some seven or eight bearings all in line, and a continuous stream of oil is forced through the bearings by a small pump driven by a worm on the main shaft.

The bearings used are extremely simple and very ingenious. The shaft runs in a gun-metal sleeve of about the usual dimensions, but between this sleeve and the surface of the pillow-block are three cylinders of thin sheet brass concentric with the shaft, and sliding loosely over the gun-metal sleeve. The gun-metal sleeve is prevented from turning by a lug projecting down at one end into a hole in the pillow block. The entire box being filled with oil, it will be seen that the shaft is free to vibrate slightly in every direction as it revolves, and that the viscosity of the oil tends to damp any such vibration. The three thin surrounding sleeves are perforated by a hole of about one-eighth inch at about every two inches, so that the oil can work freely between these sleeves. The Parsons steam turbine uses the steam expansively as a reciprocating engine does. The steam at about 125 pounds, and preferably superheated, is led into the center of a cylindrical chamber in which the moving parts revolve. There are three of these chambers. In the first chamber the steam is expanded down partially, and thence goes to a second similar chamber and finally to a third one, which last chamber leads to the condenser. In each of these chambers the steam in its passage from the admission to the exhaust has to pass some thousands of small blades or teeth which project from the surface of the disks a fraction of an inch. The amount of steam used and its expansion will depend upon the clearance, and the number of these turbine disks it has to pass in getting to its exhaust. It will be evident that the friction of the engine is less than that of a reciprocating engine, and that the condensation losses should be less. Also full advantage can be taken of high pressure and especially of superheated steam, for the difficulties of proper lubrication and packing in the presence of high temperature steam in a reciprocating engine do not apply to this engine.

Tests by Professors Ewing and Kennedy indicate that this turbine, when in perfect condition, has an efficiency of one kilowatt hour in electrical energy produced by 28 pounds of feed water, the turbine being operated condensing. This is equivalent to about 15.7 pounds of water per indicated horse-power per hour, and I understood that in a recent competition a guarantee was made by Mr. Parsons which was equivalent to about 13 pounds per indicated horse-power per hour, and that his guarantee was lower than that of the best triple compound condensing engines of the reciprocating type which were in the competition. At Newcastle-on-Tyne I saw a central station of about 25,000 lights operated solely by these steam turbines, and which has been in operation since 1890, and has been earning and declaring dividends ever since it started. An interesting fact as to this Newcastle station is that all of the conductors are laid underground and consist of vulcanized rubber cables drawn into cast-iron pipes which are gas and water-tight, and through which chemically dried air is forced from the station by a blower.

There are over six miles of piping and over 25 miles of cable, and after five years' operation Mr. Parsons states that they have not had a single instance of failure of insulation, explosion or other trouble with the underground system.

THE LAVAL STEAM TURBINE.

Before leaving the subject of steam turbines, I will describe the Laval steam turbine of which I saw a number in the works of the manufacturers, Breguet & Company, of Paris. This steam turbine differs radically from the Parsons. The power is derived from the momentum of a jet of steam impinging upon buckets near the periphery of a disk, so that the machine is somewhat comparable to the Pelton water wheel. The steam, which is preferably used at a high pressure and exhausting into a vacuum, is expanded in a nozzle

before reaching the disk, and reaches the buckets of the disk fully expanded, and hence moving at a very high velocity, which the inventor claims is 3,000 feet per second for steam at 85 pounds per square inch exhausting into the air, and 3,700 feet exhausting into vacuum. The nozzle makes a very slight angle with the plane of the disk. The admission of steam is controlled by a centrifugal throttling governor. The number of revolutions of the disk per minute varies from about 30,000 to 15,000, in sizes from five to 50 horse-power. The buckets are milled out of a solid disk of steel just inside of the periphery, so as to leave a solid band on the circumference. The edges of the buckets are quite sharp. The disk in a case of a 50 horse-power turbine is about half an inch thick. This disk is mounted on a small steel flexible shaft at a point about one-third from one end. At the high speeds in question, a body tends to revolve about an axis through the center of gravity, and since it is impracticable to make the center of gravity absolutely coincident with a straight line joining the bearings, Mr. Laval has used a flexible shaft so that the disk is free to assume such a position as to revolve practically around an axis, through the center of gravity, and consequently the disk revolves with perfect smoothness and without any trouble at the bearings at these enormous speeds.

No successful way has been perfected as yet for operating a dynamo directly at these speeds, and so Mr. Laval gears from his turbine shaft to two dynamo shafts, one on each side of the turbine shaft, by means of double helical gears beautifully cut, which reduce 10 to one, and upon these two driven shafts are placed the dynamo armatures, two driven shafts being used so as to balance the side thrust on the bearing of the turbine shaft. The Laval people claim as high efficiency as that of any steam engine of the same horse-power, and there seems no good reason to doubt their ability to secure such an efficiency which they guarantee fully and specifically.

A careful test made at Stockholm in 1893 showed an efficiency of 20 pounds of water per horse-power hour with steam at 113 pounds initial pressure and used condensing. The weight of this turbine is about 30 pounds per horse-power in a size of about 30 horse-power.

The simplicity of this steam engine, also its theory and practical design in detail, are most beautiful and it seems likely to become an important factor in the electrical field. What is needed is a generator of electricity directly driven by, or preferably constituting a part of, the revolving disk, and here is food for considerable thought.

FIVE-WIRE SYSTEM.

At Manchester I saw the five-wire plant designed by Dr. Hopkinson and recently installed. I inspected the central station for a few minutes only, as unfortunately those most familiar with the principal features of the system were absent at the time of my visit. The dynamos were bipolar machines driven from vertical engines by means of link belts with idlers. I cannot say that I was favorably impressed with the generating plans or distribution system, as far as I could judge of them in such a brief observation.

(To be continued.)

The village of Northfield, Vt., has voted to purchase the electric light plant which has been run by a private concern.

TO MAKE SAFES BURGLAR-PROOF BY ELECTRICITY.

BY G. P. HACHENBERG, M. D.

Much ingenuity has been expended to make safes burglar-proof, but only with partial success. Great skill, expense and labor can firmly close up a safe, but there has been always a counter skill evidenced by burglars by either force or tact to open it. The plain question before us is, Can a safe be made perfectly burglar-proof? Not on the method safes are made now. The only means to give reliable protection to a safe is not in the strength and massiveness of its structure, in the power and complication of its lock, but only by the aid of electricity. I am prepared to say, with every confidence in the practicability of my suggestion, that I can make a safe out of a pine, store box, and place in it the funds of a bank, and it would be impossible for the most skillful burglar to molest it without being detected. It might be said, if this protection of a safe is rendered by an electrical process, the felonious electrician might find no trouble in robbing such a safe. But we have made ample provision even to defy the electrical expert. He cannot open our safe without giving ample notification of what he is doing. He may naturally be led to seek for an electrical outlet, and may ultimately find it; but the very act to cut off that outlet would be one of the main things that would lead to the detection. But let him even know this secret, of course it would be hands off, from that part. Should he do the least violence to the safe, to cause the least vibration, his detection would be as readily effected as before.

Now what is he to do? He has to give it up!

We make these preliminary remarks for the benefit of the electrical expert; for, if I were not to say another word on our subject, he would fully comprehend what revelation we had to make. At least, Mr. Edison would, if he will allow me to say so.

The electrical construction for the kind of a safe in question is in part represented in the annexed cut. An apparatus is constructed with a base A that will hold it perfectly firm and level. It has two upright pieces of wood or metal C, C, about six inches high, with a cross-piece D to hold an insulated delicate metallic cord E, or rather a wire of the minutest attenuation as to thickness, either straight or spiral. At the end of this cord E is attached a ball of copper F, that clips or rather is suspended a little over half way into a copper cup G. This ball is to be in the closest proximity with the cup, but not in immediate contact with it. The cup receives one of the poles to be connected with a small Tiemann's chloride of silver dry cell battery B, which is placed with this apparatus in the safe. The pole H, from the cord or wire, is connected with an electrical alarm bell placed at any desired distance. With this arrangement, the least vibration of the safe, caused by a blow, the opening of its door, or even by walking across the floor where the safe may be, the ball will be brought in contact with the cup and the alarm will be given at the bell.

But so far the arrangement would be imperfect, if other provisions were not resorted to, as the current may be cut off from the bell before the alarm is given. Therefore the very act of cutting off the current (or rather to have it from reaching the bell), must be made the means to give the alarm. In this lies the perfection of the arrangement. This is brought about by a counter or rather a subsidiary current of electricity, having no connection with the battery mentioned above; but has one of its own that is likewise placed in the safe and connected with the alarm bell in the distance. Here we have a double electrical system and they are not the same. The one is brought into play only when any vibration throws the

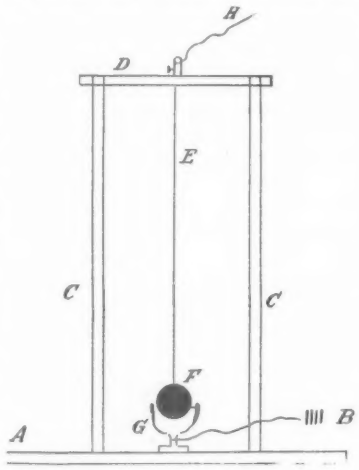


DIAGRAM OF CONNECTIONS FOR A BURGLAR-PROOF SAFE.

ball against the cup; the other has a permanent current, in order to keep the magnet locked at the bell; but as soon as the current is broken by a break at the safe or at any other place, the alarm is given by a clockwork arrangement connected with the bell magnet. But we have to give further security to our safe by giving attention to the outlet of the wires from the safe. There are but two wires that do service; but we add to these several more to form a cable, which would have only two live wires, the rest being dead ones. With these, a combination within the safe is made, somewhat in the fashion of a combination lock. The outlet of this cable is through one of the tubular legs of the safe, then under the floor or mason work into the wall of the building, and from there on, as the best ingenuity may suggest. It may create a smile with some, for me to suggest running the cable through one of the legs of the safe, and placing it within an inch of the burglar's hands. Well let him make his first assault on that leg, if he knows which one it is, what would be the result? It matters not by what process he may attempt to manipulate the safe, by hand, blows, or explosives, the electrical alarm would be given at the bell.

The object of the electrical combination is to give the electrical burglar the least possible chance to feed the wire that holds the magnet in lock at the bell.

I conceive no way for a burglar to get into our electrical safe, except to corrupt, kill, or to cause thorough intoxication of the watchman at the bell.

Thin Versus Thick Fires.

A statement is making the rounds of the technical press to the effect that there is considerable economic gain in carrying thin fires in steam generators—tabular data of experiments made showing marked decrease of fuel burned for the lighter beds of coal.

As a matter of fact, economy in steam raising is more a question of "general average" than of mere depth of fire, or any other single factor, and the weight of coal per unit area of grate that gives excellent results with a certain draught pressure, firing interval, etc., is entirely inadmissible under different conditions.

A thin fire requires, and during an experiment would receive, greater care in maintaining even distribution of the fuel, and with a draught just suited to the rate of combustion, the total fuel consumption being also properly related to the special radiation losses and heating surfaces, the efficiency of the boiler would be a maximum as regards water evaporated per pound of coal.

But let the same boiler require forcing, for increased demands on the power, more coal must be used per hour and the draught therefore increased.

If the same thickness of bed be maintained, the furnace door must be opened oftener, in direct ratio of the fuel burned, and the amount of air passing through uselessly will be approximately as the square of the coal consumption.

If the air used was correct for the first rate of steaming it will be in excess for the second case, and the furnace temperature will fall, resulting in loss of efficiency, and this can only be remedied in regular practice by carrying a heavier bed of coal and keeping to the original firing interval.

Where forcing is necessary the heavier bed allows of "side firing"—coaling alternately at sides of furnace—and this maintains more even heating effects than where the raw fuel is thrown over the whole grate at once.

The grade of fuel also calls for consideration, different brands of coal requiring each its particular layer depth for the most thorough combustion, and the manner of inducing the draught, whether by a chimney (or its equivalent), or by increasing the ash pit pressure, very greatly affects the performance.

Laboratory engineering is a pleasant and at times a profitable employment, but those who indulge the spirit of exact research should carefully guard against the drawing of general conclusions from isolated instances.

Proper encouragement to a genuine fireman will be found of far more benefit in reducing the costs of steam generation than all the hard-and-fast regulations as to depth of fuel, etc., that can be devised and kept in force for regular every day running.—*American Machinist.*

THE STUDY OF ATMOSPHERIC ELECTRICITY AT SEA.

BY PROFESSOR W. F. MAGIE IN THE "AMERICAN METEOROLOGICAL JOURNAL."

During the Summer of 1 89, while at sea in the United States Fish Commission Schooner "Grampus," I had an opportunity to make a few observations on the electricity of the atmosphere in the way recommended by Exner. My report was published in connection with Professor Libbey's account of the expedition in the Bulletin of the Fish Commission, Vol. IX, but it has been suggested that a statement of my conclusions might still be acceptable in this Journal.

The observations were made to determine whether the conditions at sea are favorable for systematic work on atmospheric electricity. It is difficult on land to find a place where observations can be made, which is free from the effects of irregularities in the earth's surface or the proximity of surrounding buildings, and it is impossible to avoid the presence of dust in the air in amounts which vary from hour to hour, and which introduce errors that cannot be estimated or allowed for. To such disturbing influences, Exner describes the occasional observation of negative potentials in the air, which, on his theory, are otherwise impossible. He especially states that, owing to the dust, observations made in the Summer time are utterly unreliable. So far as my observations went, they showed that such disturbances were not important at sea. A position can be selected on the vessel so situated that the slight changes in the vessel's trim, incident to the ordinary conditions of sailing, will have practically no effect at the points where the collector is held; and the constant effect due to the vessel as a whole can be determined once for all by simultaneous observations made on the vessel and in a small boat at some distance from it. In this way, the potentials relative to the true earth's surface can be obtained with more accuracy than under the usual conditions on land. Besides, the air above the ocean at long distances from shore is only in rare instances laden with dust particles. Flying spray might give trouble in rough weather, but in the pleasant Summer days on which my observations were made there were no indications of any disturbances from this cause.

The instrument used was a Thomson portable electrometer. A comparison of this instrument with Exner's portable gold leaf electrometer led me to adopt it as more sensitive and more accurate. It is only fair to add that it is also much more expensive. The collector used was made on Exner's pattern, in which advantage is taken of the fact that a flame assumes the potential of the surrounding air. A candle, shielded by a sheet-iron chimney, was mounted on the end of a vulcanite rod, and a wire, the point of which terminated in the candle flame, led to the electrometer. I have since found that a more convenient collector can be made by substituting for the candle an alcohol lamp in which the flame is formed over wire gauze. The flame of such a lamp is maintained in winds in which it is impossible to keep a candle lighted.

The potentials were measured at points two, three and four metres above the deck of the vessel, on the weather quarter. In connection with them, readings of the wet and dry bulb thermometers were taken, from which both the relative humidity and the weight in grammes of the water vapor in a cubic metre were calculated. The clouds and the state of the atmosphere were also recorded. The potential was always positive and increased with the elevation. The potential differences for a difference in elevation of one metre varied from seven volts to 100 volts. No relation appeared between the potential and the humidity. On the whole the potential differences were greater when the sky was clear, though there were some marked exceptions to this rule. From a series of observations made for me at Princeton by Mr. John Zimmerman of the college, I am led to believe that many of the inconsistencies that appear in any comparison of the potentials with the humidity or with the clearness of the sky are due to the effects of wind. The potentials are generally greater when the wind blows, and this effect of the wind is often more than enough to counterbalance the opposite effect due to a clouded sky, and to give unusually high potentials on cloudy days.

The investigation of the origin and the laws of atmospheric electricity is beset with such difficulties that it is certainly important to obtain the observations upon which our conclusions are to be based at stations at which the controllable conditions shall be as simple and as uniform as possible. My experience at sea, short as it was, convinces me that such observations can be made nowhere to better advantage. A sufficiently large series of them made at several ocean stations might enable us to determine definitely whether the potentials and the humidity are so closely related as Exner maintains, and also to form some accurate notion of the effects due to clouds, to mist and to wind. The elimination of all occasional disturbances which such a study might render possible would lead to the determination of the value of that most important cosmical constant, the true potential of the earth. It is possible, too, that such a study would reveal some law connecting the observed potentials with the state of the atmosphere, that might be of service in weather prediction.

No place could be better suited for such observations that an isolated lightship. There may be some few lighthouses sufficiently remote from the coast to be suitable stations also, though the fine spray which always fills the air where the sea breaks might prove a serious annoyance, even when in other respects they were most favorably placed. Are not the questions involved of sufficient importance to call for a systematic study of atmospheric electricity by the Weather Bureau? If the proper stations could be secured by the co-operation of the Lighthouse Board, the opportunities offered for useful observations in this field would certainly surpass any that have hitherto been given.

SIGNS OF BETTER DAYS.

A RETURN OF BUSINESS PROSPERITY SHOWN BY INCREASED COMMISSIONS.

Mr. T. H. Banks, of Harvey Fisk & Sons, the big bond house, said of the business situation to-day:

Signs of solid improvement continue to multiply. The tone everywhere is better. During the past week there has been an increased inquiry for railroad bonds. The demand before had been light for a long time. Mercantile people tell me the call for goods is growing. In casual conversation a day or two ago, the head of a large uptown firm said that his salesmen's commissions so far this year had been larger than for any previous equal period in a number of years. This is certainly an indication that business is much better throughout the country than seems generally understood. All the markets are better, and I see little ahead to check a healthy growth of confidence.—*Mail and Express, New York.*

Flushing, Mich., has had plans prepared for a complete electric lighting and waterworks system, to cost $20,000. A special election to vote on the question of bonds will probably be called for the last of March.

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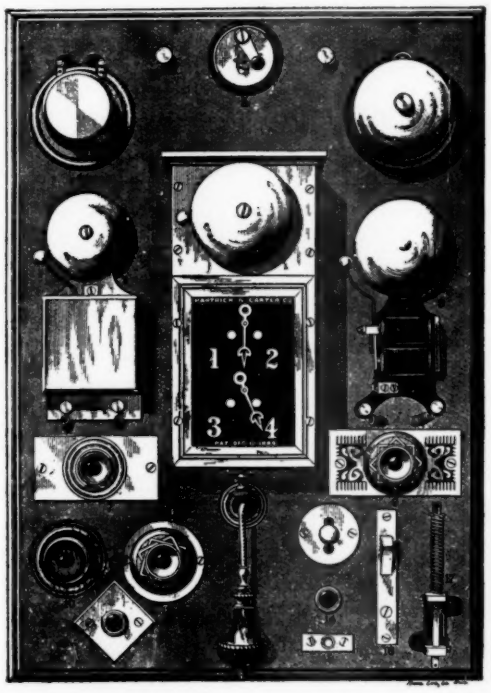

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The Metropolitan Electric Company, of Chicago, has issued a large calendar embellished with a very striking design from a wash drawing.

The National Conduit Manufacturing Company, Times Building, New York, has secured contracts for all the underground work to be done in Boston during 1895 by the West End Street Railway Company, the Boston Electric Light Company and the New England Telegraph and Telephone Company. The work will be commenced about April 15.

The Walker Manufacturing Company.—In this column in the ELECTRICAL REVIEW for March 6, 1895, was published a list of contracts closed by the Walker Manufacturing Company, of Cleveland. Instead of this list representing a year's work, as was stated, the Walker company writes that all the contracts were closed inside of two months, from January 1, 1895.

Partrick & Carter Company, of Philadelphia, have prepared a very handsome sample board of some of their house goods specialties, designed especially for small dealers and those who do not as yet carry a stock of such supplies. Everything is connected and in complete working order for practical exhibition. The board is made of hard wood with dealer's name and address in gilt letters. The company's advertisement in this issue contains an illustration of this new sample board, which will be boxed and shipped complete with battery, on receipt of price.

Wm. H. Wilkinson & Company.—The business of manufacturing crank-pin and cross-head-pin oilers, oil-distributing device for vertical engines, sight-feed oil cups, and oiling devices generally, heretofore carried on at 352 Atlantic avenue, Boston, by William H. Wilkinson, will hereafter be continued under the firm name of Wm. H. Wilkinson & Company, Mr. Albert R. Smith becoming interested in the business. The new company hope, by continued efforts to please, in the quality of goods, as well as reasonable prices and prompt and courteous treatment, to receive and merit the same consideration and favor as has been accorded Mr. Wilkinson in the past.

Mr. Timothy W. Sprague, of Boston, has established himself as a consulting engineer, making a specialty of electric mining installations, and has taken offices in the Postal Telegraph Building, 253 Broadway, New York, and in the Exchange Building, 53 State street, Boston. Mr. Sprague is well qualified both by training and experience to undertake such work. He was graduated from the Massachusetts Institute of Technology as a mining engineer, and for five years was connected with the power and mining departments of the Thomson-Houston Electric Company and the General Electric Company. He spent a year with a well-known engineering firm and was at one time a member of the ELECTRICAL REVIEW staff. Mr. Sprague has many friends in the electrical field, all of whom will doubtless join the ELECTRICAL REVIEW in wishing him the fullest success.

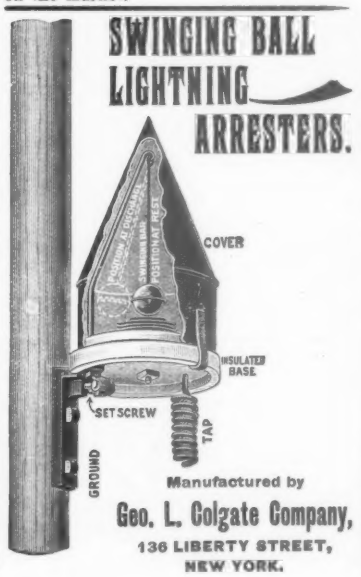
Jarvis B. Edson, 87 Liberty street, New York city, manufacturer of the well-known Edson pressure-recording and alarm gauge, reports an active demand for his instruments, with numerous inquiries from every section of the country. Among recent purchasers are the following:

Metropolitan West Side Elevated Railway Co., Chicago, Ill.; Commonwealth Water Co., Summit, N. J.; West Orange Water Co. (2), West Orange, N. J.; Ashton Valve Co., New York; Riverside Fibre Co., Appleton, Wis.; Providence Engine Co., Providence, R. I.; Arnold-Constable Building, New York; Empire Rubber Co., Trenton, N. J.; W. R. Grace & Co. (6), for South America, New York; Trinidad Electric Light and Power Co., Trinidad, W. I.; Galveston Water Works (2d order), Galveston, Texas; West End Street Railway Co. (2 gauges, 4th order), Boston, Mass.; Illinois Eastern Hospital for the Insane, Kankakee, Ill.; J. S. Brown Hardware Co., Galveston, Texas; Maryland Electric Co., Baltimore, Md.; American Tobacco Co., Richmond, Va.; M. M. Buck & Co., St. Louis, Mo.; Economy Heat, Light and Power Co., Scranton, Pa.; Edison Electric Light Co., Columbus, Ohio; Italian Government (9 gauges, 2d order), Rome, Italy; Halifax Waterworks, Halifax, N. S.; Greenville Water and Light Co., Greenville, Texas; Brooklyn Electric Manufacturing Co., Brooklyn, N. Y.; Ashcroft Manufacturing Co., New York; Morrison & Cass Paper Co., Tyrone, Pa.; Heydrich, Raffloer & Co., Havana, Cuba.

Among others the following important buildings will be equipped with the Edson recorders: Presbyterian Building; New York Life Insurance Co.; Clearing House Association; Surety Building; St. Luke's Hospital; City Hall, Paterson, N. J.

WOVEN WIRE BRUSHES.

The Belknap Motor Co., of Portland, Maine, are the patentees and manufacturers of the best woven wire commutator brush on the market.



SWINGING BALL LIGHTNING ARRESTERS.

Manufactured by
Geo. L. Colgate Company,
136 LIBERTY STREET, NEW YORK.

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(Stationary, Locomotive or Marine); Mechanics; Mechanical Drawing; Electricity; Architecture; Architectural Drawing and Designing; Masonry; Carpentry and Joinery; Ornamental and Structural Iron Work; Railroad Engineering; Bridge Engineering; Municipal Engineering; Plumbing and Heating; Coal and Metal Mining; Prospecting, and the English Branches. Students make rapid progress in learning to Draw and Letter. The Steam Engineering course is intended to qualify engineers to secure Licenses. Send for Free Circular, stating the subject you wish to study, to

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THE INTERNATIONAL CORRESPONDENCE SCHOOLS, Scranton, Pa.

THE WYCKOFF PIPE CO., INCORPORATED,
Williamsport, Pa.
Creosoted Wyckoff Tubing for Underground Electrical Work.

Trade ROLL DROP Mark.
COMMUTATOR BARS.
Full particulars on request.
FOREST CITY ELECTRIC WORKS,
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THE PERFECTION DYNAMO BRUSH
PATENTED FEBRUARY 5, 1895.
FLEXIBLE, REDUCES SPARKING, SAVES COMMUTATOR.
Elegantly made. Try them. Woven Wire. Pure Copper.
MANUFACTURER
CHAS. E. CHAPIN, 136 Liberty St., N. Y.

The Mather Electric Company
MANCHESTER, CONN.
POWER GENERATORS, for Lighting and Railway Purposes,
COMPLETE STATION EQUIPMENTS.
Mather Apparatus for sale exclusively in their respective territories by the following well-known and reliable Contractors:
J. HOLT GATES, 1140 Monadnock Building, Chicago, Western Contractor.
H. B. COHO & CO., 203 Broadway, N. Y. City, Brooklyn and vicinity, and New Jersey.
G. M. ANGIER & CO., 64 Federal Street, Boston, Mass., New England.
S. N. BLAKE, Elmira, N. Y., Northern and Western New York.
THE WILL & FINCK CO., 818 Market Street, San Francisco, Agent for Pacific Coast.

The Consolidated Electric Storage Co.,
44 Broad Street, New York.

WHITE-CROSBY COMPANY,
CONTRACTING ENGINEERS,
EQUITABLE BUILDING, BALTIMORE, MD.
New York Office, 29 Broadway.
Chicago Office, The Rookery.

W. R. OSTRANDER & CO.
No. 204 FULTON ST., NEW YORK.
Manufacturers of
SPEAKING TUBES, WHISTLES, ANNUNCIATORS.
Electric and Mechanical Bells.
FACTORY,
De Kalb Ave.,
BROOKLYN.
Send for Illustrated Catalogue.

Dynamos and Motors AND PARTS OF SAME
ALL KINDS PRICES OF PARTS TELEPHONES ELECTRICAL SUPPLIES
SEND STAMP FOR CATALOGUE PALMER BROS. CHANUS, CONN.

ELECTRIC CONDENSERS.
WM. MARSHALL,
Manufacturer.
STANDARDS A SPECIALTY.
703 LEXINGTON AVENUE, NEW YORK.

ELECTRO-MAGNETS
FOR ALL
ELECTRICAL PURPOSES.
The Varley Duplex Magnet Co.,
64 CORTLANDT ST., N. Y.

ROYCE & MAREAN,
DEALERS IN
Electrical Supplies,
WASHINGTON, D. C.

Sight Feed Oil Cups.
AUTOMATIC "WIPING DEVICE"
For oiling Crank and Cross-head Pins.
WM. H. WILKINSON & CO.,
352 Atlantic Ave., Boston, Mass.